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ABSTRACT

This teaching guide on masonry building maintenance, one in a series of six publications designed for building maintenance instructors in Texas, is designed to give students an understanding of masonry construction. Introductory material provides teachers with information on use of the units of instruction and personalization and localization of the units. From the five units of instruction, each consists of eight basic components: performance objectives, suggested activities, information sheets (content essential for meeting the cognitive requirements), assignment sheets (application of knowledge), job sheets (procedures to give direction to the skills being taught), transparency masters, unit tests, and test and assignment sheet answers. The five units cover introduction to masonry, concrete finishing, masonry tools and materials, masonry construction, and masonry cleanup and repair. (YLB)

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TX 8313304

Units of Instruction

BUILDING MAINTENANCE

ED240374

MASONRY

Teacher's Guide

Prepared by
Bill Barnes, Ph.D.

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BUILDING MAINTENANCE

MASONRY CLEANUP AND REPAIR

CONTENTS

PREFACE

ACKNOWLEDGMENTS

USE OF INSTRUCTIONAL UNITS

UNIT NUMBER	UNIT TITLE
I	INTRODUCTION TO MASONRY
II	CONCRETE FINISHING
III	MASONRY TOOLS AND MATERIALS
IV	MASONRY CONSTRUCTION
V	MASONRY CLEANUP AND REPAIR

PREFACE

BUILDING MAINTENANCE: MASONRY is one in a series of six publications designed for CVAE Building Maintenance instructors in Texas. This multi-year effort is an attempt to provide the entry-level competencies that need to be developed to enable graduates of building maintenance programs to enter employment in a variety of jobs.

This volume is designed to give the student understanding of masonry construction. The organization and content are due primarily to the excellent input of the members of the teacher advisory committee who reviewed the materials in the draft stage. This material gives basic information designed to assist teachers in improving instruction, and thus improving student performance. It is the responsibility of each instructor to personalize and localize each lesson in meeting the needs of their students

The instructional materials in this publication are written in terms of student performance based upon measurable objectives. Criterion-referenced tests have been included to provide a means of measurement of student progress.

It is the belief of the OCL staff that the format we use for presentation of material is one of the best. We sincerely encourage feedback from user of our material in order to enable the OCL staff to better meet the needs of vocational teachers and students.

Bill Barnes, Director
Occupational Curriculum Laboratory
East Texas State University

ACKNOWLEDGMENTS

Appreciation is extended to the many individuals who contributed their time and experience to the development of these materials for BUILDING MAINTENANCE: MASONRY

The contents of this publication were designed by the statewide Building Maintenance Advisory Committee. Members of this committee generously provided input and reviewed materials as they were developed by OCL staff. Special thanks must go to the following instructors. This may not be a complete list of participants, as staff for this publication has changed during the development phase of this effort. Our apologies are extended to any instructor which was omitted from the list.

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Credit must be extended to the staff of the Division of Occupational Education and Technology for their direction and leadership in initiating and supporting this effort.

Special credit is extended to Durwin Hohhertz for the development of this effort through the first draft stage. The organization and contents of this publication are due to his efforts while he was director of the OCL.

Gratitude is expressed to all members of the OCL staff who, as usual, did an exemplary job in typing, editing, preparation of graphics, and printing of this document.

USE OF THE INSTRUCTIONAL UNITS

The Building Maintenance instructional units cover certain instructional areas in the shop program. Each includes the basic components of a unit of instruction: performance objectives, suggested activities, information sheets, assignment sheets, job sheets, transparency masters, unit tests, and answers to unit tests. Units are planned for more than one classroom period of instruction.

Careful study of each instructional unit will enable the teacher to determine:

A. The amount of material that can be covered in each class period.

B. The skills that must be demonstrated.

C. The supplies and equpiment needed for skill performance.

D. The amount of classroom time needed for teacher demonstration and student practice.

E. Supplementary materials that must be ordered.

F. Any resource personnel who must be contacted.

The specific components of an instruction unit perform the following functions:

OBJECTIVES

Each unit of instruction is based on performance objectives. These objectives specify the exact behaviors the students will be exhibiting, thus providing students with a sense of direction.

Performance objectives are stated in two forms. The unit objectives state the materials to be covered in the unit of instruction and how the student will handle the material. Specific objectives state the types of performance the student will be doing to satisfy the unit objective.

A classroom discussion should follow immediately after the students read the objectives so that any quetsions concerning the performances expected of the student can be answered.

SUGGESTED ACTIVITIES

Each unit of instruction has a Suggested Activities Sheet outlining steps to follow in accomplishing specific objectives.

Instructor--Duties of the instructor will vary from unit to unit, but the following are minimum activities for the instructor:

1. Provide students with objectives, information, assignment and/or job sheets.

2. Discuss objectives and information sheets

3. Make transparencies

4. Demonstrate procedures outlined on job sheets (when included)

5. Give test

6. Review the students' tests to identify weak areas

Any additional instructional activities and teaching methods to aid students in accomplishing the objectives are strongly encouraged.

Student--Student activities are listed to help the student achieve the objectives of the unit.

INFORMATION SHEET

Information sheets provide content essential for meeting the cognitive requirements of the unit. These sheets provide an excellent guide for presenting knowledge necessary to develop the skills specified in the unit objective.

Student should read the information sheets before the information is discussed in class. Students are encouraged to make any additional notes on the information sheets to help them in their learning process.

TRANSPARENCY MASTER

Transparency masters provide information in a special way. Transparencies may present new information, or they may reinforce information presented in the information sheets. They are particularly effective when identification is necessary.

Make the transparencies from the masters and place them in your notebook ready for immediate use.

Copies of transparency masters can be made and used as student handouts to supplement the material contained in the information sheet.

JOB SHEETS

Job sheets are an integral part of each unit of instruction. The instructor should be able to demonstrate the skills outlined in the job sheets. Procedures specified in the job sheets give direction to the skill being taught and allow both student and teacher to check student progress in performing the skill. Job sheets provide a ready outline to students and furnish to potential employers a picture of the types of skills being taught. Job sheets may be used as an individual or teamwork project.

ASSIGNMENT SHEETS

Assignment sheets give direction to study and furnish activities which provide application of the knowledges contained in the information sheet. These may be given to the student for completion in class or used for homework assignments. Asnwer sheets are provided for checking student progress.

UNIT TEST

Unit test questions have been constructed to measure student achievement of each specific objective listed on the objectives sheet. Individual test items may be pulled out and used as an objective. This kind of testing may be used as a daily quiz and will help the teacher spot difficulties being encountered by students in their efforts to accomplish the terminal objective.

ANSWERS TO UNIT TEST

Test answers are provided for each unit. These may be used by the teacher and/or student for checking student achievement of the objectives.

PERSONALIZING AND LOCALIZING INSTRUCTIONAL UNITS

Carefully review each instructional unit before using in the classroom. In reviewing the units, you may find it necessary to localize and personalize the units based upon your expereince and the needs of your students.

Some of the ways of supplementing units are the use of audiovisuals, field trips, resource personnel, games and simulations, case studies, peer teaching, role playing, and personal experiences of both the teacher and students.

Various methods may be used in localizing a unit of instruction. You may wish to apply units of instruction to the local community, add additional materials from newspapers and magazines, invite local resource people, and arrange field trips.

In personalizing a unit of instruction, you may want to make the course content relevant to home and/or work situations. You may wish to involve students in the planning of the unit by using their own personal experiences. Having students involved in the teaching of some of the materials is sometimes an effective example of peer teaching.

Remember that as an instructor, you may wish to add objectives to the units of instruction based on the individual needs of the student or employers in your area. You should add assignment and job sheets as necessary and construct a corresponding unit test item for ecah added objective.

MASONRY

NAME

DATE COMPLETED

UNIT I		
	Information Sheet--Occupational Information	
	Assignment Sheet 1--Develop a Safety Idea	
	Assignment Sheet 2--Identify Handtool Dangers	
UNIT TEST		
OBJECTIVE	To identify the types of jobs and safety practices associated with masonry-related jobs.	
UNIT II		
	Information Sheet 1--Concrete Preparation	
	Assignment Sheet 1--Identifying Concrete Tools	
	Assignment Sheet 2--Figure Concrete Quantities and Cost	
	Information Sheet 2--Paving and Finishing	
	Job Sheet 1--Construct a Form for a Flagstone	
OBJECTIVE	Job Sheet 2--Pouring and Finishing a Flagstone	
UNIT TEST		
	To identify materials and tools required in finishing concrete, and to construct forms and finish a slab.	
UNIT III		
	Information Sheet 1--Tools	
	Information Sheet 2--Materials	
	Assignment Sheet 1--Identify Masonry Materials	
	Assignment Sheet 2--Survey of Masonry Materials	
UNIT TEST		
OBJECTIVE	To identify the tools and materials used in masonry work.	

UNIT IV		
	Information Sheet 1--Mortar Preparation	
	Job Sheet 1--Prepare a Mortar Mix	
	Job Sheet 2--Supply a Mortar Stand with Mortar	
	Job Sheet 3--Spread Mortar	
	Information Sheet 2--Wall Construction	
	Job Sheet 4--Lay a Corner Lead Six Courses High	
	Job Sheet 5--Complete a Wall Between Corner Leads	
UNIT TEST		
OBJECTIVE	To prepare mortar mix and construct a masonry wall.	
UNIT V		
	Information Sheet 1--Cleanup (new)	
	Assignment Sheet 1--Cleaning New Masonry	
	Job Sheet 1--Clean a Brick Wall	
	Information Sheet 2--Cleaning Block	
	Job Sheet 2--Clean a Block Wall	
	Information Sheet 3--Mortar Joint Repair	
	Job Sheet 3--Mortar Joint Repair	
	Information Sheet 4--Concrete Repair	
	Job Sheet 4--Concrete Repair	
UNIT TEST		
OBJECTIVE	To clean brick and cement walls, and repair small sections of masonry.	

This student has completed the indicated training under my supervision.

_____

INSTRUCTOR

UNIT I

INTRODUCTION TO MASONRY

UNIT OBJECTIVE

After completion of this unit, the student will be able to identify the types of jobs and the safety practices associated with masonry-related jobs. This knowledge will be evidenced through demonstration ard by satisfactorily completing the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student will be able to:

1. Match terms associated with masonry occupations to the correct definitions.
2. Point out the nature of work involved in masonry occupations.
3. Identify the types of jobs associated with masonry occupations.
4. Select the correct safety rules to be followed when using masonry tools and equipment.

UNIT I

INTRODUCTION TO MASONRY

SUGGESTED TEACHING PROCEDURES

I. Objective Sheet

A. Discuss unit objective with students.

B. Discuss each specific objective with the students and relate each to Building Maintenance.

C. Organize the sequence of objectives to fit shop organization and procedures.

D. Add any neccessary objectives to fit local needs and program.

II. Information Sheets

A. INFORMATION SHEET--OCCUPATIONAL INFORMATION

1. This sheet introduces terminology, nature of work types of related jobs and safety factors.

2. Discuss the areas introduced, emphasizing the safety aspects of each area.

III. Transparency Masters

(NOTE: Transparency masters are included in the student manuals and may be used as information sheets)

A. I-TM-1--Develop a Safety Attitude

B. I-TM-2--Keep Hand Tools in Place

C. I-TM-3--Be Sure Scaffolds are Secure

D. I-TM-4--Keep Your Hands Away From Turning Mixers

E. I-TM-5--Clean up Spilled Gasoline

F. I-TM-6--Keep a Firm Grip

IV. Assignment Sheets

A. ASSIGNMENT SHEET 1--DEVELOP A SAFETY IDEA

1. Provide ideas or bring a safety poster.

2. Display and discuss with class all completed work.

B. ASSIGNMENT SHEET 2--Identify Handtool Dangers

1. Have students complete assignment sheet.

2. Discuss the answers after completion. Have students identify other possible safety factors.

V. Unit Evaluation

A. Give the unit evaluation.

B. Score the evaluations, discuss any areas which were missed by the students.

VI. References:

A. Dalzell, Ralph J. and Gilbert Townsend. Masonry Simplified, Vol. I. Chicago, Illinois: American Technical Society, 1956.

B. Bricklaying I. Brick Institute of America. Albany, New York: Delmar Publishers, Inc., 1951.

UNIT I

INTRODUCTION TO MASONRY

INFORMATION SHEET--OCCUPATIONAL INFORMATION

I. Terms and definitions

A. Caustic--Any material that can cause burns by chemical reaction, such as an acid.

B. Cement--A powder made of lime, gypsum, iron ore, alumina, and silica which is used in making concrete.

C. Concrete--A mixture of cement, sand, and gravel which will harden when mixed properly.

D. Lime--A caustic material used in making mortar mix.

E. Masonry--A term which refers to anything made of stone, concrete, brick, or tile materials.

F. Mortar mix--A material containing lime which is used to bond brick or stone.

G. Muriatic acid--An acid combined with water which is used to remove dried mortar from masonry walls.

H. Precast--A concrete product which is poured at a plant in a form or mold and then delivered to the construction site.

I. Plaster--A much made cement, clays and other materials used to produce durable exterior or interior wall finishes.

J. Terrazzo--A masonry product made of different sizes and shapes of flat marble stones which are set unevenly in concrete.

II. Nature of work--Masonry Occupations

A. Involve working on jobs with just a few people, or on large construction jobs with many people.

B. Provide jobs that involve a lot of "headwork" when compared to those that require skilled "handwork."

C. Offer job opportunities that require either specialized workers or those who can do a number of different jobs.

D. Allow a broad range of occupational choices:

1. Residential construction

2. Commercial construction

3. Ready-mix plants

4. Precast products plants

5. Building repair or maintenance

6. Business ownership

E. Require the use of many handtools and some power equipment.

F. Require physical work, both inside and outside of buildings.

(NOTE: Jobs such as brick masons and cement finishers depend on the weather for working time.)

G. Depending on the place of employment, working hours can vary from 40 to 60 hours weekly.

H. Differ in salaries at various locations or on different types of jobs.

(NOTE: Since many masonry-related jobs are seasonal, a good hourly salary does not always insure a good yearly salary.)

I. Offer limited benefits, such as vacations, insurance, and retirement.

III. Types of masonry jobs

(NOTE: Most construction workers will specialize in only one or two types of masonry jobs.)

A. Cement finisher--Pours concrete into forms and produces the required finish.

(NOTE: Some finishers will build forms and place reinforcement steel in forms.)

B. Brick mason--Constructs walls or structures of brick, concrete block, or other masonry material.

C. Precast-product plant worker--Sets up molds and forms to pour products such as beams, road pipe, stepping stones, and other concrete products.

D. Ready-mix plant worker--Operates heavy equipment and machinery to prepare cement, sand, and gravel in making concrete which is delivered to a construction site.

E. Plasterer--Applies cement plaster to building surfaces as a finish coat or to provide a surface to apply tile or terrazzo.

(NOTE: This job may also be called a tile setter.)

F. Building maintenance mason--Mixes and applies mortar to cracks in masonry walls and concrete surfaces.

(NOTE: Some maintenance works may be required to set up forms and pour larger concrete projects.)

IV. Safety

A. Masonry hand tools

1. Be aware of sharp edges on hand tools such as trowels.

2. Remember that brick hammers are made of hardened steel and can shatter if struck too hard (Transparency 1).

3. Striking tools with hardened surfaces against other hardened surfaces will cause damage.

4. Replace all hand tools in the proper place after use (Transparency 2).

5. Be careful and avoid dropping hand tools from scaffolds.

B. Equipment

1. Mortar stand

a. Should be placed within easy reach of the mason.

b. Should be set up so it is level and steady.

c. Should be correctly loaded to prevent overloading on an edge or an end, which can cause the stand to fall.

2. Scaffolds (Transparency 3)

a. Should be strong enough to safely hold the worker, mortar, and bricks.

b. Should be secured to prevent tipping over.

c. Should be loaded correctly to prevent overloading on an edge or at the end.

3. Wheelbarrow

a. Helps prevent back strain when used to move heavy loads.

b. Tips over easily if overfilled.

C. Personal safety equipment

1. Hard hat--protects head; should <u>always</u> be worn when doing masonry work.

2. Steel-toed shoes--Protect feet from injury caused by dropping hard objects.

3. Safety glasses--protect eyes; should be worn when using a masonry saw.

4. Rubber gloves--Protect hands from acid burns.

D. Power equipment (Transparency 4)

1. Masonry saw

a. Always wear eye protection when using a masonry saw.

b. Keep hands away from blade while power is connected.

c. Check electric cord for frayed or bare wires.

2. Electric mortar mixer (Transparency 5)

a. NEVER place hands in a turning mixer.

b. DO NOT put a shovel or any other object in a turning mixer.

c. Check electric cord for frayer or bare wires.

d. Stay clear of pulleys, belts, and gears.

3. Gasoline-powered mixer (Transparency 6)

a. ALWAYS fill gasoline tank while in a open area.

b. DO NOT start the motor if gasoline is spilled on the engine. Wait until gasoline has evaporated.

c. Move gasoline can away from mixer before starting motor.

d. DO NOT put hand or any object in a mixer while it is turning.

e. Stay clear of pulleys, belts, and gears.

4. Power trowel (Transparency 7)

a. DO NOT tie the switch at the ON position so that it cannot automatically turn OFF.

b. Keep a firm grip on the handles at all times.

c. DO NOT start the motor if gasoline has been spilled. Wait until gasoline has evaporated.

d. Get help when moving the trowel.

e. Keep feet away from blades and moving parts.

DEVELOP A SAFETY ATTITUDE

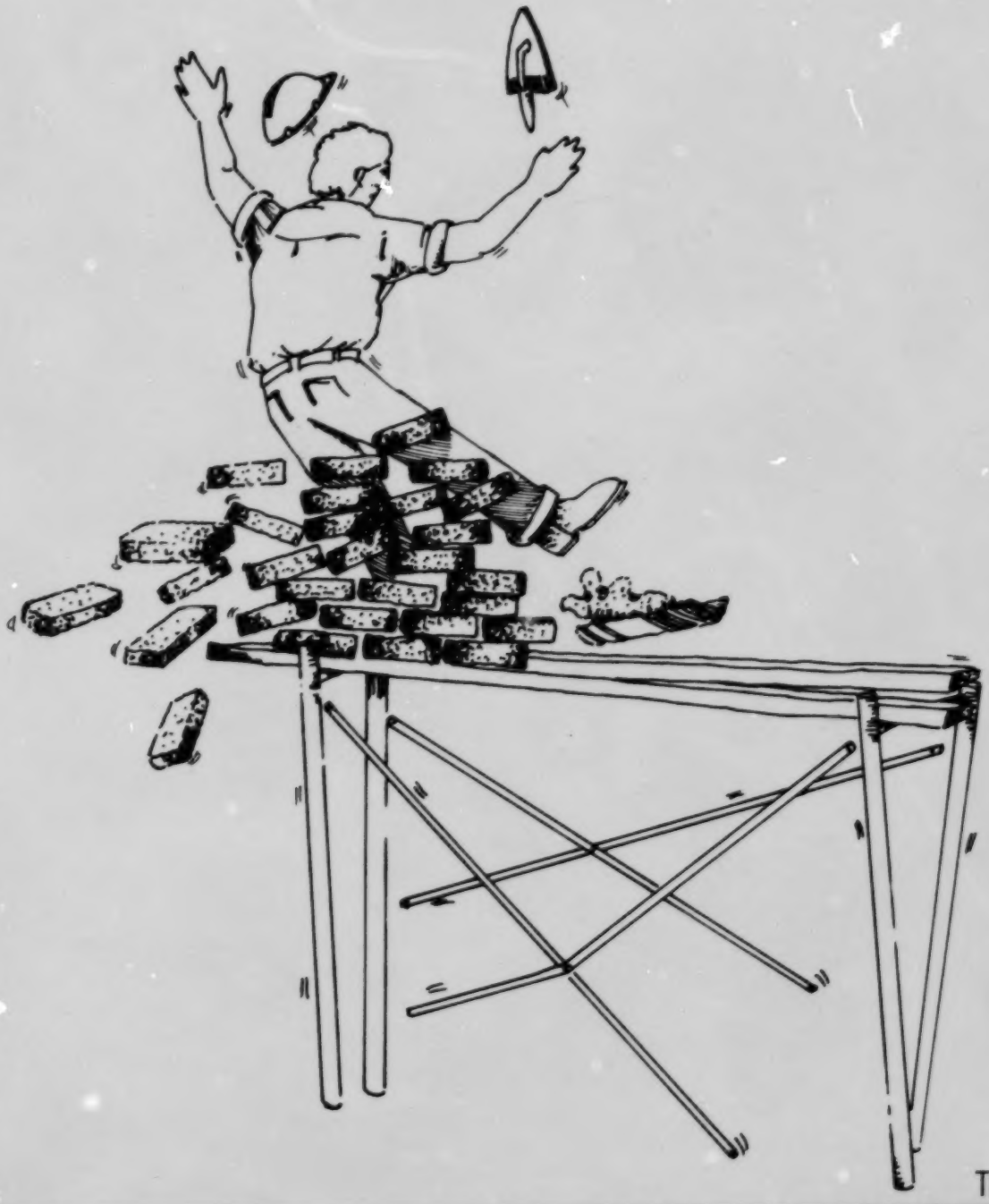
HARDENED STEEL
CAN SHATTER

TM-1

KEEP HAND TOOLS IN PLACE

TM-2

BE SURE SCAFFOLDS ARE SECURE

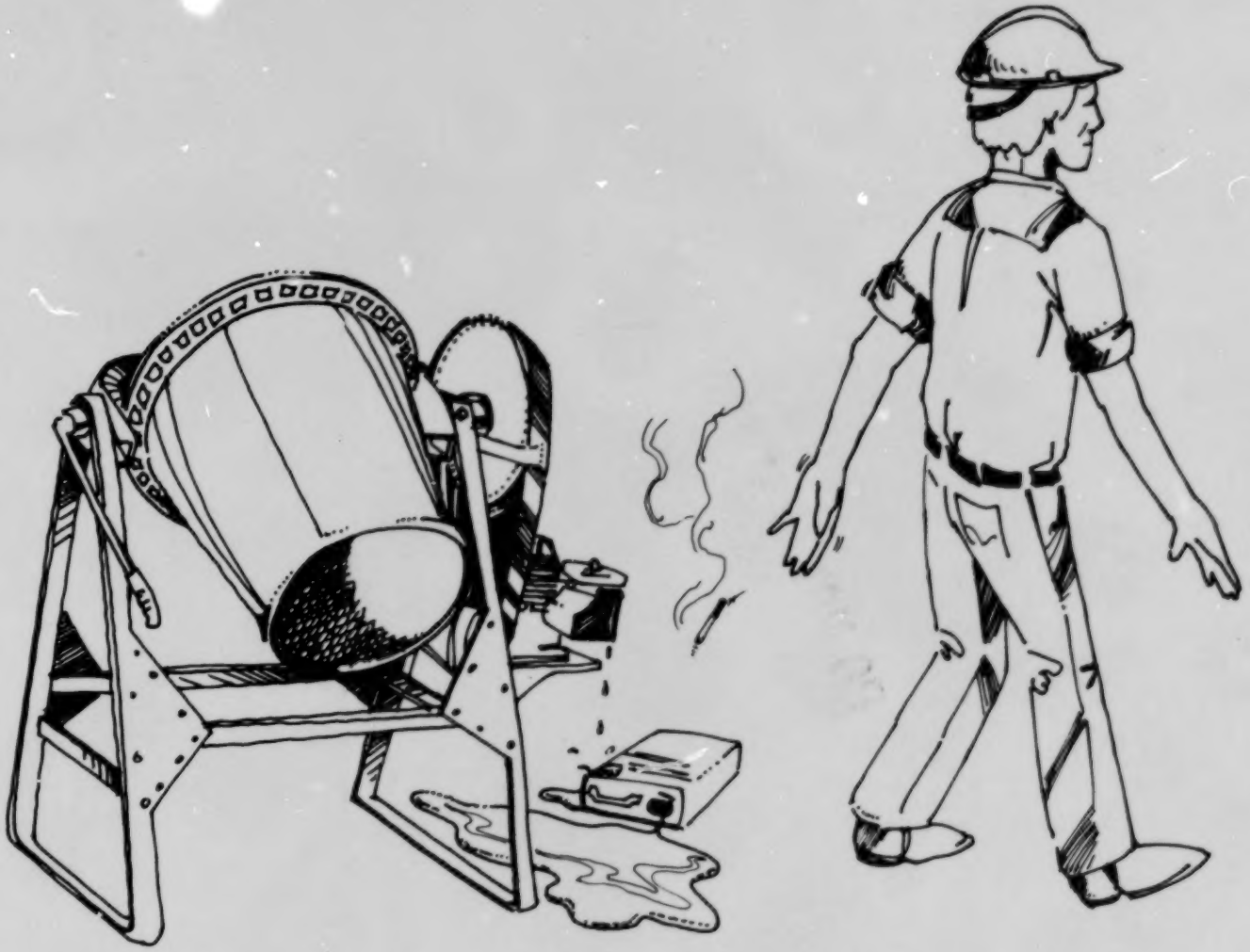


TM-3

KEEP YOUR HANDS AWAY FROM TURNING MIXER

TM-4

CLEAN UP SPILLED GASOLINE



TM-5

17

23

24

KEEP A FIRM GRIP

TM-6

19

UNIT I

INTRODUCTION TO MASONRY

ASSIGNMENT SHEET 1--DEVELOP A SAFETY IDEA

Directions: On a piece of poster board or sheet of typing paper, prepare a poster about masonry safety. You may want to use some of the safety rules covered in the Information Sheet for ideas in making your poster.

(NOTE: The instructor will want to display your poster as a safety reminder.)

ASSIGNMENT

UNIT I

INTRODUCTION TO MASONRY

ASSIGNMENT SHEET 2--IDENTIFY HANDTOOL DANGERS

Directions: Write the possible hazards that exist in each situation below. Describe what could happen.

A. Hammers with large chips knocked out of the face.

B. A person is cutting brick without safety glasses.

C. Cords going to a mixer is frayed.

D. A trowel is nicked and has sharp burrs.

E. Gasoline is spilled on a hot engine.

F. A gas can is left sitting by the motor on the mixer.

UNIT I

INTRODUCTION TO MASONRY

TEST

1. Match terms associated with masonry occupations to the correct definition by writing the number of each term in the correct blank.

_____a. A masonry product made of different sizes and shapes of marble stones which are set in concrete.

_____b. An acid used to remove dried mortar from masonry walls.

_____c. Any material that can cause burns by a chemical reaction.

_____d. A term which refers to anything made of stone, concrete, brick, or tile.

_____e. A material containing lime which is used to bond brick or stone.

_____f. A powder made of lime, gypsum, iron ore, alumina, and silica which is used in making concrete.

_____g. A mixture of cement, sand, and gravel.

_____h. A concrete product which is poured in a mold and then delivered to the construction site.

1. Cement
2. Precast
3. Muriatic
4. Terrazzo
5. Masonry
6. Mortar mix
7. Concrete
8. Caustic

2. Point out the nature of work involved in masonry occupations by answering "True" or "False" to each statement below.

_____a. Involves working on jobs with one person only.

_____b. Require no skills.

_____c. Provide a broad range of occupations.

_____d. Demands the use of many types of tools and equipment.

_____e. Masonry workers are held to 30 hours of work per week.

_____f. Salaries are set at minimum wage by the union.

_____g. Provides limited benefits.

3. Identify the types of jobs associated with masonry occupations by writing the name of each listed below in the correct blank.

Cement finisher
Brick mason
Precast product plant worker
Readymix plant worker
Plasterer
Building maintenance mason

_____a. Pours concrete into forms and produces the required finish.

_____b. Constructs walls or structures of brick or other masonry material

_____c. Applies cement plaster to surfaces as a finished surface or as a base for other masonry materials.

_____d. Operates heavy equipment and machinery to prepare cement, sand, and gravel in making concrete.

_____e. Sets up molds and forms to pour products such as beams, road pipe, stepping stones, and other concrete products.

_____f. Mixes and applies mortar to cracks in masonry walls and concrete surfaces.

4. Select the correct safety rules by circling the number in front of the words that best completes each phrase below.

a. A trowel should be used carefully because of:

(1) sharp edges

(2) germs

(3) weight

b. Brick hammers are made of hardened steel and can:

(1) be too heavy to lift

(2) shatter if struck against other hardened surfaces

(3) cause strained muscles if used for long periods of time

c. Mortar stands should be placed:

(1) within easy reach

(2) at a safe distance from the house

(3) shoulder level

d. Scaffolds should be built with:

(1) light boards so they can easily be moved

(2) scrap lumber to prevent waste

(3) materials strong enough to support the worker, mortar, and bricks

e. Wheelbarrows should be used to:

(1) push your friends around

(2) lift light loads

(3) move heavy loads

f. The correct personal safety equipment that should be worn in masonry occupations is:

(1) rain coats and rubber boots

(2) hard hats, steel-toed shoes, and safety glasses

(3) casual slacks with shined shoes

g. Gasoline engine tanks should always be:

(1) filled while in an open area

(2) cleaned occasionally with gasoline

(3) started with the gas cap off

h. One should avoid _____ power equipment

(1) the use of

(2) touching moving parts on

(3) checking the oil on

UNIT I

INTRODUCTION TO MASONRY

ANSWERS TO TEST

1. a. 4
   b. 3
   c. 8
   d. 5
   e. 6
   f. 1
   g. 7
   h. 2

2. a. False
   b. False
   c. True
   d. True
   e. False
   f. False
   g. True

3. a. Cement finisher
   b. Brick mason
   c. Plasterer
   d. Ready mix plant worker
   e. Precast product plant worker
   f. Building maintenance mason

4. a. 1
   b. 2
   c. 1
   d. 3
   e. 3
   f. 2
   g. 1
   h. 2

UNIT II

CONCRETE FINISHING

UNIT OBJECTIVE

After completing this unit, the student will be able to identify the materials required to prepare a concrete slab site and select the proper tools used for working and finishing concrete. The student will also be able to construct forms and finish the slab. This knowledge will be evidenced through demonstration and by satisfactorily completing the unit test.

SPECIFIC OBJECTIVE

After completion of this unit, the student will be able to:

1. Match terms associated with concrete finishing to the correct definition.
2. Identify the materials used for site preparation.
3. Determine the proper composition of concrete.
4. Match the terms associated with concrete pouring and finishing.
5. Identify the tools used for working concrete.
6. Identify the tools used to finish concrete.
7. Select the correct methods of finishing concrete.
8. Point out the things the finisher should consider before pouring and finishing concrete.
9. Demonstrate the ability to:
   a. Construct a form for a flagstone.
   b. Pour and finish a flagstone.

UNIT II

CONCRETE FINISHING

SUGGESTED TEACHING PROCEDURES

I. Objective Sheet

A. Discuss Unit Objective with students

B. Discuss specific objectives with students and relate each to work situations

C. Organize the unit objectives to fit the local curriculum

D. Add objectives as needed to meet local program emphasis

II. Information Sheets

A. INFORMATION SHEET 1--CONCRETE PREPARATION

1. Use this to introduce terms, site preparation, forms, and composition of concrete.

2. Discuss each term as it is introduced and point out how each will be used on the job.

B. INFORMATION SHEET 2--PAVING AND FINISHING

1. Use this to introduce additional terms, tools, and processes.

2. Introduce each term and demonstrate each tool as it is mentioned.

III. Transparency Masters

A. II-TM-1--CONCRETE WORKING TOOLS

B. II-TM-2--CONCRETE FINISHING TOOLS

C. II-TM-3--PORTABLE CONCRETE MIXER

D. II-TM-4--POWER TROWEL

E. II-TM-5--STAKES AND SPREADERS

F. II-TM-6--TYING REBAR

IV. Assignment Sheets

A. ASSIGNMENT SHEET 1--IDENTIFYING CONCRETE TOOLS

1. This assignment sheet is a classroom activity to identify tools. Actual tools could be used if available.

2. Allow students to demonstrate the use of tools as a reinforcement activity.

B. ASSIGNMENT SHEET 2--FIGURE CONCRETE QUANTITIES AND COST

1. Use this material to introduce the students to calculating amounts and costs of concrete.

2. If possible, obtain assistance from a local concrete company in teaching cost estimating.

V. Answers to Assignment Sheets

VI. Job Sheets

A. JOB SHEET 1--CONSTRUCT A FORM FOR A FLAGSTONE

1. Observe each student's progress, and provide assistance if necessary.

2. Demonstrate how to set forms before allowing students to attempt this job.

B. JOB SHEET 2--POURING AND FINISHING A FLAGSTONE

1. After all students have completed Job Sheet 1, set aside a day when everyone in the class will pour and finish a flagstone, thus allowing for cleanup all at one time.

2. Conduct a contest to choose the best flagstone.

3. Donate the completed flagstones to the school, and use these to pave a walkway where needed on the campus.

VII. Unit Test

A. The unit evaluation is divided into two parts to correspond with the two information sheets.

B. The instructor may want to add evaluations to the unit.

VIII. Answers to Unit Test

A. Answers are based on the material covered in this unit.

B. A grading key might be of help if there are a number of students in the class.

IX. References

A. Feirer, John L., and Gilbert R. Hutchings. Carpentry and Building connstruction. Peoria, Illinois: Chas. A. Bennett Co., Inc. 1976.

B. Wagner, Willis H. Modern Carpentry. South Holland, Illinois: Goodheart-Wilcox Co., Inc., 1976.

UNIT II

CONCRETE FINISHING

INFORMATION SHEET 1 -- CONCRETE PREPARATION

I. Terms and definitions

A. Cement--A bonding material that hardens when mixed with water.

B. Concrete--A mixture of cement, sand, gravel, and water, combined in varying amounts according to intended use.

C. Fill sand--The material used under concrete slabs to bring the ground level to the height desired.

D. Tie wire--Wire that is used to tie rebar together.

E. Rebar--Reinforcing steel rod used in concrete to add strength.

F. Screed--A straight piece of material, such as a 2" x 4" board, that is used to level the surface of wet concrete.

G. Duplex nails--Doubled-headed nails that are used to hold concrete forms together.

H. Knee boards--Boards that are used by the concrete worker to kneel on while working on wet concrete.

II. Site preparation materials (Transparency 1)

A. Forms

1. Use lumber strips (usually 1" x 12" lumber) held in place by stakes.

2. Clear the ground surface within the strips and level before pouring the concrete.

3. Construct forms that are strong enough to hold concrete in place until it hardens or "sets up."

4. Make the surface level of the slab of concrete even with the top of the forms.

5. Assemble forms by using duplex nails for easy disassembly.

6. Construct forms tight enough so they will not leak when wet concrete is poured into them.

B. Form stakes

1. Use 1" x 4" or 2" x 4" lumber.

2. Drive into ground next to forms to hold them in place.

C. Fill sand

1. Use to form a cushion for the concrete slab.

2. Will reduce the amount of concrete needed to fill form.

3. Serves as a bottom for slab form.

D. Reinforcement steel, usually called rebar (Transparency 2)

1. Consists of steel rod ranging from 1/4" to 1 1/2" in diameter which is placed inside of slabs as reinforcement.

2. Must be bent around the corners.

3. Should be overlapped at least 1" at the joints.

4. Raise above the fill sand by placing bricks, rocks, or wire raisers under it.

E. Reinforcement mesh, sometimes called remesh

1. Consists of crosscrossed wire (usually 10-gauge) which forms 6" squares.

2. Must be measured to fit the area to be covered.

3. Is cut to size after measuring.

(NOTE: If lapping remesh is necessary to cover the area, overlap at least 6".)

4. Should be raised above fill sand with brick pieces, rocks, or wire raisers.

5. If rebar is also used, remesh should be tied to rebar.

CAUTION: Once steel or remesh is in place, footing becomes very hazardous. WATCH YOUR STEP!

F. Grade stakes

(NOTE: These may not be necessary on small jobs.)

1. Use lumber strips, usually 2" x 2" or 4" x 4".

2. Place where needed to allow the finisher to determine the height or thickness to pour the slab.

3. Should be driven down slowly until stake is at the the correct height.

G. Spreaders

1. Consist of pieces of lumber (could be 1" x 4") cut to length to held forms apart.

2. When placed along the form boards to form a beam, these will hold the forms in place.

III. Composition of concrete when mixing for small jobs

(NOTE: On large jobs, concrete is usually premixed at a central location and is delivered by truck to the site where needed.)

A. One part of portland cememt

B. Two parts of sand

C. Three parts of gravel

CAUTION: Scratches, cuts, or open sores on a worker should be protected from wet concrete in order to prevent concrete poisioning, which can be extremely painful.

(NOTE: Mix the concrete completely, and continue mixing until all is poured.)

UNIT II

CONCRETE FINISHING

INFORMATION SHEET 2--POURING, AND FINISHING

I. Terms and definitions

A. Site--Place where concrete will be poured.

B. Pouring--Placing mixed concrete into the forms.

C. Vibrating--Removing air bubbles from wet concrete.

D. Screeding--Leveling the surface of wet concrete immediately after pouring.

E. Jitterbugging--Pushing the gravel below the surface of wet concrete.

F. Floating--Bringing water and cement to the surface of a slab.

G. Finishing--Putting the final shape and surface on uncured concrete.

H. Jointing--Putting grooves in a slab to control cracking.

I. Edging--Rounding the edge of a slab to prevent chipping or damage.

J. Troweling--Smoothing the surface on concrete.

K. Curing--A process within the concrete that makes it solid.

L. Spreaders--Wood or metal strips used to keep forms spread apart.

II. Contractor's wheelbarrow--A one-wheel cart used to move concrete or fill sand, and usually holds from 3½ to 5½ cubic feet of material.

B. Shovel--A tool used to mix concrete.

C. Knee pads--Leather or heavy rubber pads used to protect the knees while finishing concrete.

D. Concrete placer--A wide-bladed device with a handle; used to spread wet concrete.

E. Jitterbug--A tool used to tamp the gravel below the surface of wet concrete to allow a smooth finish.

F. Bull float--A device used to make the water rise to the surface of wet concrete, and to remove the water, after the wet concrete has been "jitterbugged."

G. Concrete mixer--A container in which cement, sand, gravel, and water can be thoroughly mixed. (Transparency 3)

III. Concrete finishing tools (Transparency 2)

A. Hand Trowel--A tool used for final finishing of concrete

(NOTE: Comes in various sizes.)

B. Cement edger--A small trowel with one curved edge for use on edges of slabs and sidewalks

C. Cement groover--A tool used to form grooves in sidewalks and patios

D. Inside corner trowel--A tool used to smooth inside corners, as on steps

E. Outside corner trowel--A tool used to smooth outside corners such as on steps

F. Power trowel--A machine used for rough troweling the concrete surface (TM-4)

IV. Methods of finishing concrete

A. Vibrating

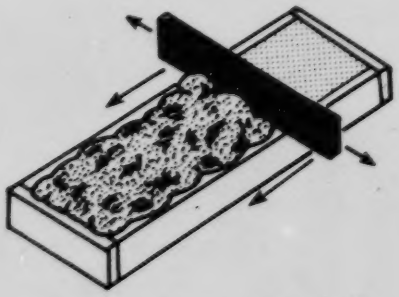
1. Use commercial vibrator, if possible

2. Use hammer to strike forms if there is no vibrator.

3. Do not let vibrator touch forms.

4. Be sure to vibrate all the way to the bottom of the forms.

B. Screeding



1. Be sure screed is straight

2. One person is on each end of screed and one is in concrete with shovel or concrete placer

3. Move screed from side to side about 6 inches, while slowly moving forward over surface

4. Keep screed on top of forms by pushing down while screeding

5. Remove excess concrete with shovel or concrete placer

C. Jitterbugging

CAUTION: Wear rubber boots while walking in concrete.

1. Use both hands on jitterbug

2. Push concrete into your tracks with your feet before jitterbugging that area

3. Always walk backward while jitterbugging

4. Do not strike or step on forms

5. Tamp firmly to push rocks or gravel below surface

6. Jitterbug in rows

D. Floating

1. If possible, do not walk on wet concrete while floating

2. Use knee boards if floating requires being on wet concrete

3. Float only until excess water is removed and paste forms on surface

E. Troweling

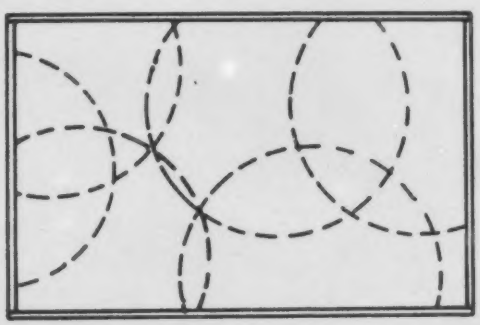
1. Troweling too soon or too late will cause a poor finish

2. Concrete must <u>begin</u> to set up before troweling

3. The forward edge of the trowel should be held about 1/8 inch above the concrete

4. Amount of pressure to apply will vary, depending upon how much the concrete has set up

5. Trowel in overlapping semi-circles as shown below



6. Edge the corners with cement edger

7. Re-trowel surface and edges if necessary

(NOTE: It may be necessary to trowel as many as 3 times times to get desired finish.)

V. Pouring and curing considerations

A. Pouring concrete

1. Always fill beams first, beginning at farthest corner

2. Pouring too fast may move forms

3. Fill to top of forms

B. Curing concrete

1. Protect concrete from rapid drying

2. Keep the concrete above freezing until it has set

3. Concrete should be allowed to cure for at least 2 days before working on top of slab

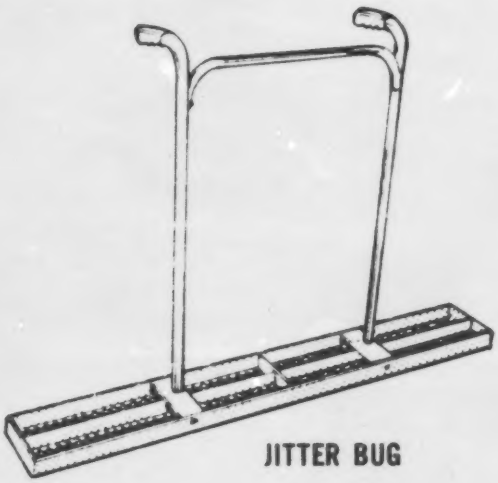
CONCRETE WORKING TOOLS

CONTRACTORS WHEELBARROW

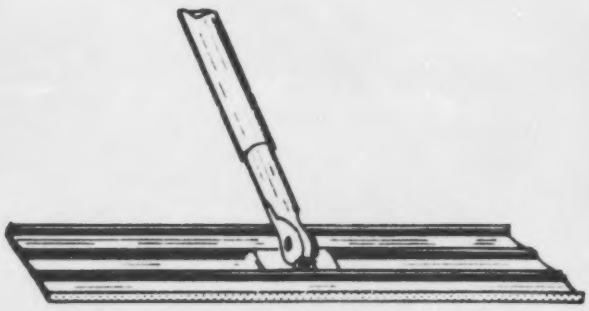
KNEE PADS

SHOVEL

CONCRETE PLACER



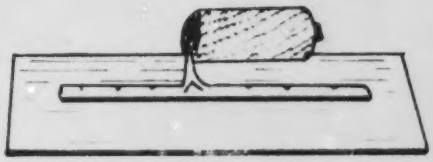
JITTER BUG



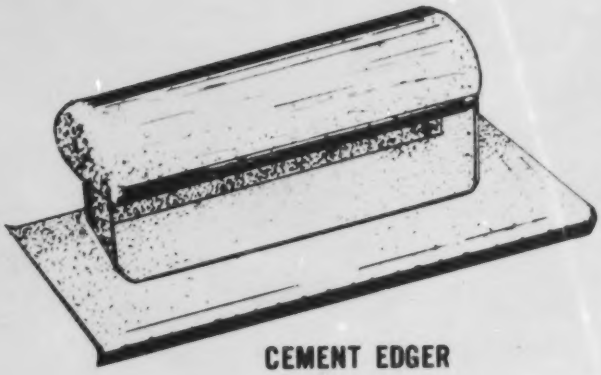
BULL FLOAT

TM-1

CONCRETE FINISHING TOOLS

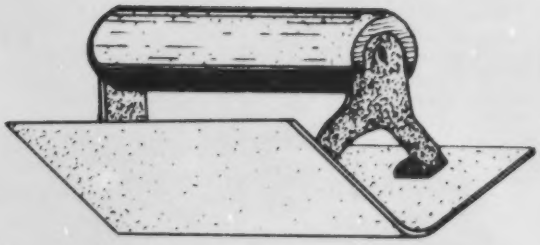


TROWEL

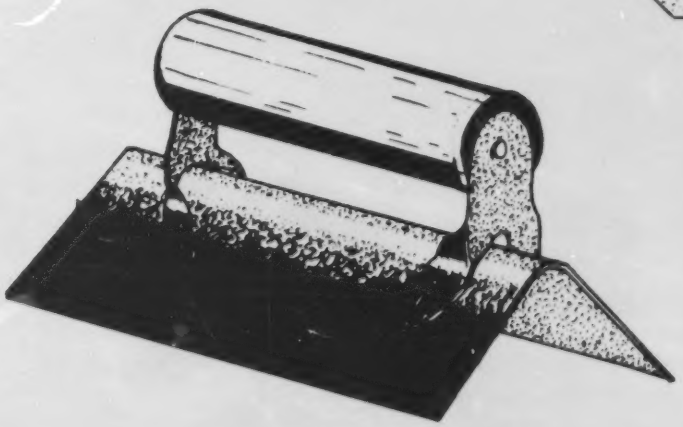


CEMENT EDGER

CEMENT GROOVER



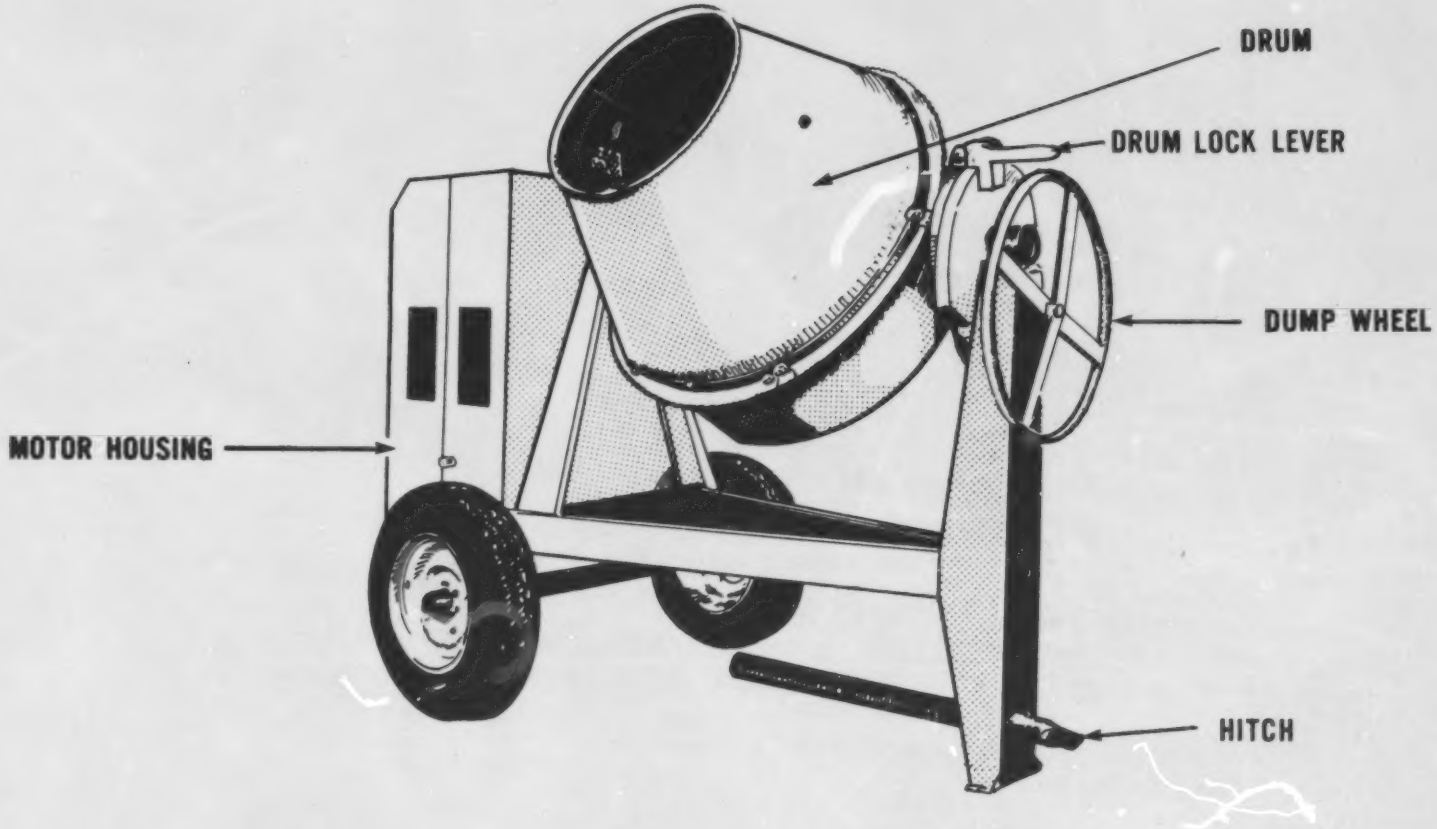
INSIDE CORNER TROWEL



OUTSIDE CORNER TROWEL

TM-2

PORTABLE CONCRETE MIXER



TM-3

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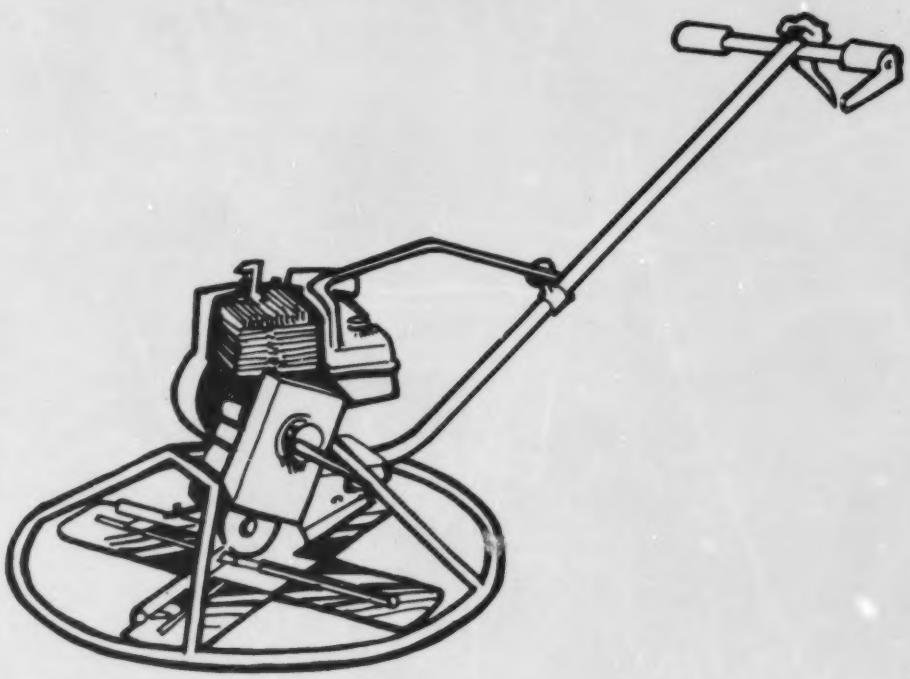
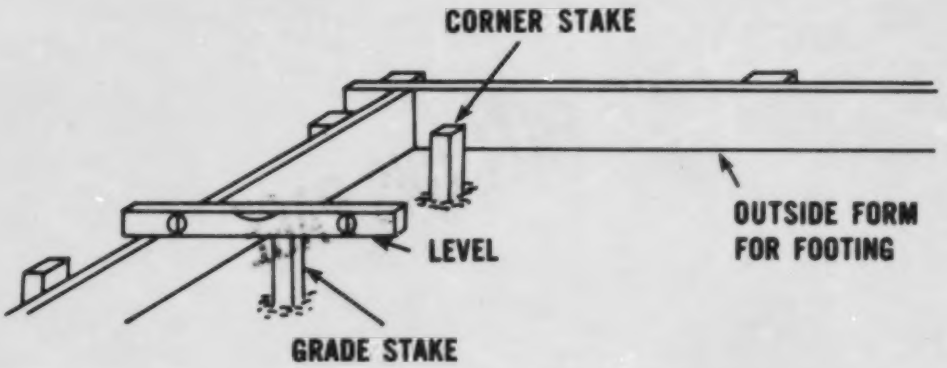
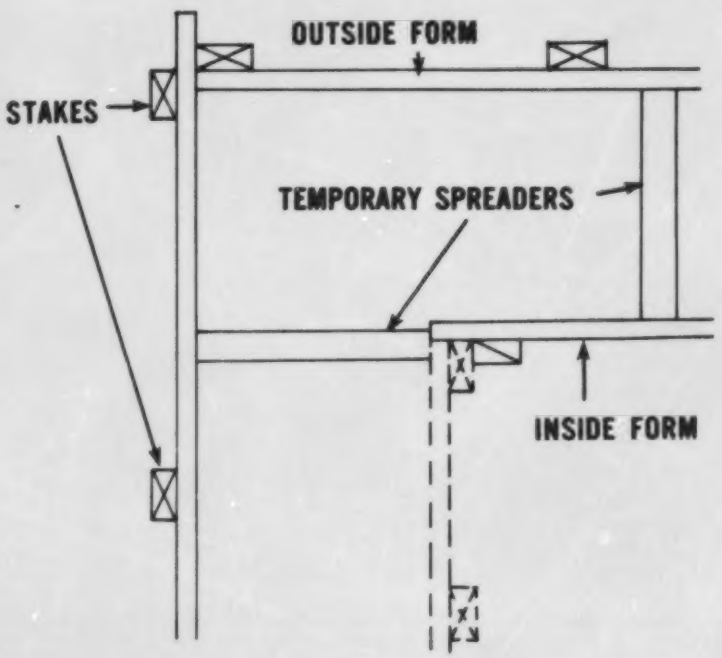
POWER TROWEL



TM-4

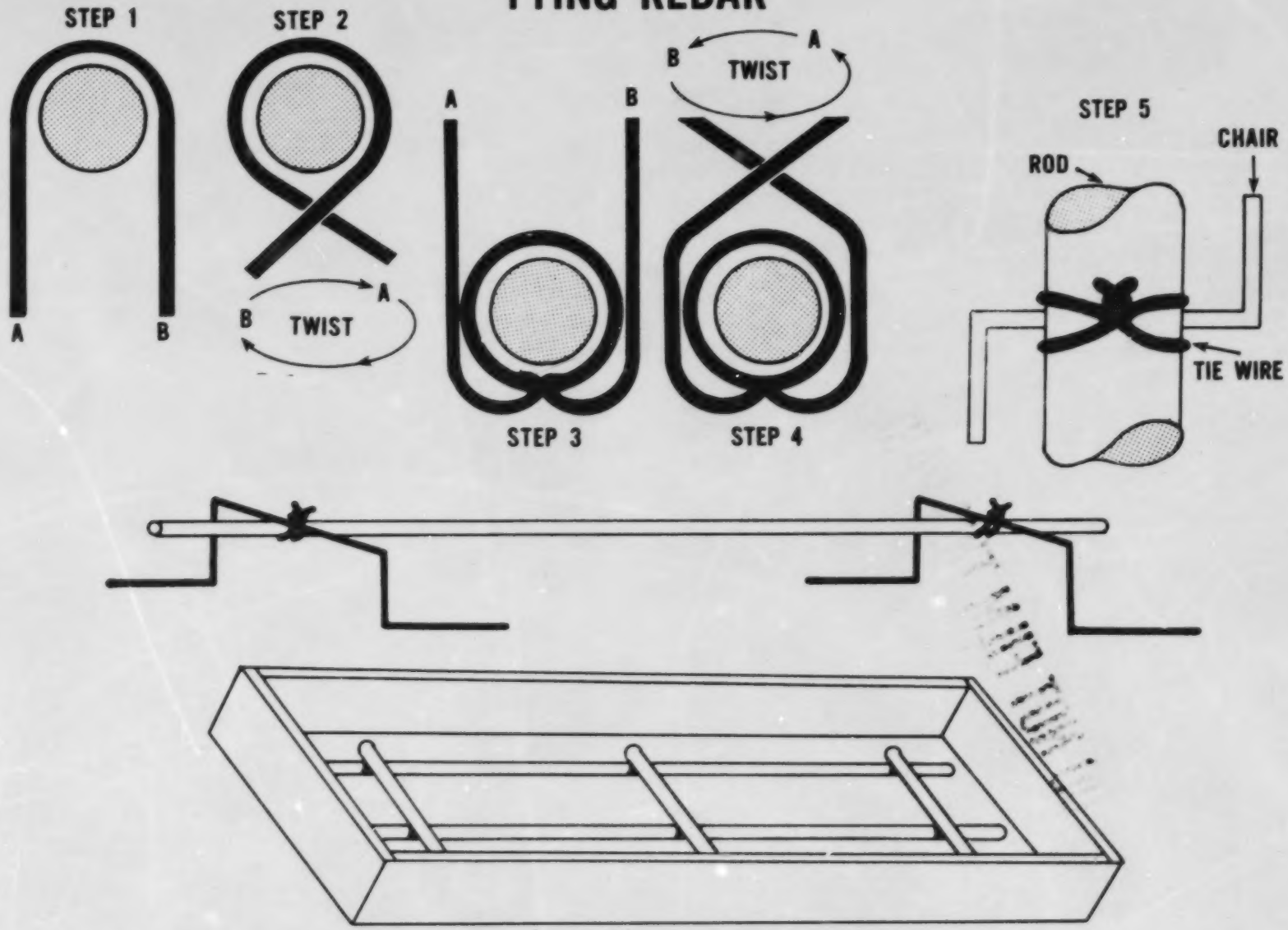
STAKES AND SPREADERS





TM-5

TYING REBAR



TM-6

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UNIT II

CONCRETE FINISHING

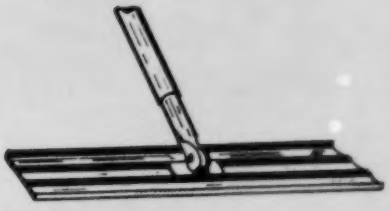
ASSIGNMENT SHEET 1--IDENTIFY CONCRETE TOOLS

Directions: Identify the tools used for working concrete by writing the correct name from the list below in the blank provided. On the right side of the sheet, describe the use of the tool.

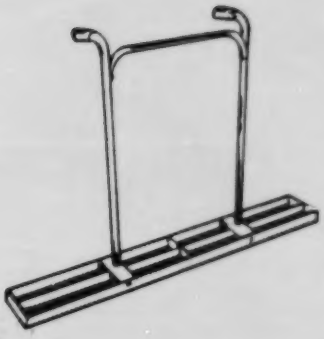
Bull float
Jitterbug
Concrete placer
Wheelbarrow

A. _____

B. _____



C. _____



ASSIGNMENT

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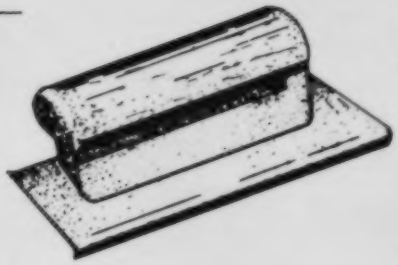
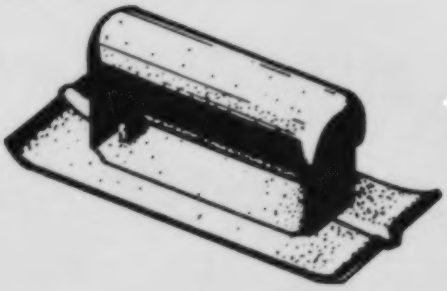
D. _____

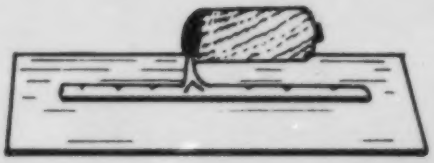
E. _____



F. _____



G. _____



UNIT II

CONCRETE FINISHING

ASSIGNMENT SHEET 2--FIGURE CONCRETE QUANTITIES AND COST

Directions: Following the information and examples given below, figure the amount of concrete required and the cost for each job listed on the following page.

EXAMPLE: To figure the cost of concrete required for a job, you must first determine the quantity of concrete needed in cubic yards. One cubic yard of concrete will pour a slab that is 3" thick with 108 square feet, or a slab that is 4" thick with 81 square feet.

To find the amount of concrete needed to pour a slab that is 10' x 20' and 3" thick, first find the number of square feet in the slab. Then, divide that number by 108 to find the number of cubic feet. Multiply the number of cubic feet by the cost of concrete per cubic yard to find the total cost of the concrete.

10' x 20' = 200 square feet (in the slab)

3" thick slab

```
          1.85 cubic feet
    108)200.00 square feet
        108
        ---
         920
         864
         ---
          560
          540
```

$30.00 per yard for concrete

1.85 cubic feet x $30 = $55.50 for concrete

For slab 4" thick, figure this way:

4" thick slab

```
          2.46 cubic feet
     81) 200.00 square feet
         182
         ---
          380
          324
          ---
           560
           486
```

2.46 cubic feet x $30 = 73.80 for concrete

ASSIGNMENT

A. How much concrete would be required to pour a three-inch thick slab that is 20' x 40', and how much would the slab cost if the price of concrete is $45.00 per cubic yard?

B. How much concrete would be required to pour a sidewalk three feet wide and 150 feet long, and how much would the sidewalk cost if the price of concrete is $47.00 per cubic yard?

C. How much concrete would be required to pour a four-inch thick slab that is 30' x 60', and how much would the slab cost if the price of concrete is $35.00 per cubic yard?

UNIT II

CONCRETE FINISHING

JOB SHEET 1--CONSTRUCT A FORM FOR A FLAGSTONE

I. Tools and materials

A. Hammer

B. Framing square

C. 24-inch level

D. 16 d duplex nails

E. Two pieces of lumber 2" x 4" x 16"

F. Two pieces of lumber 2" x 4" x19 1/4"

G. 15" x 15" piece of remesh

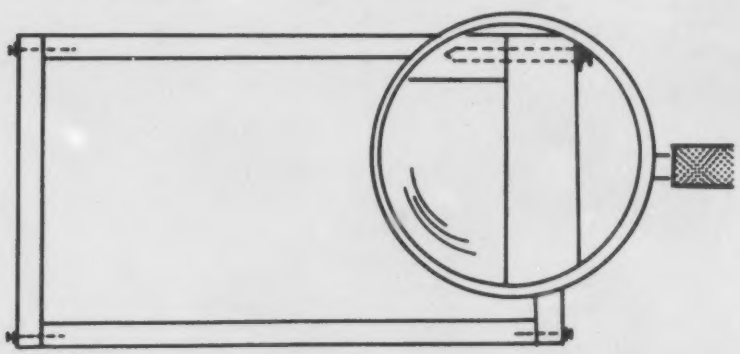
H. 8 stakes

II. Procedure

A. Level and clear ground where form will be placed

B. Nail 4 pieces of 2 x 4s together as shown below

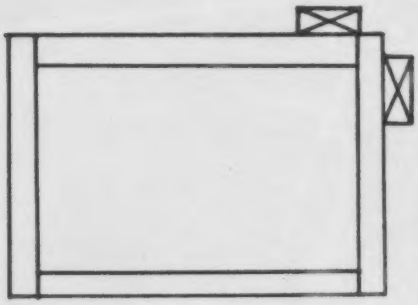
(NOTE: Drive duplex nails in snuggly to first head.)



C. Use two nails at each corner

D. Lay forms in position and check for squareness with a square

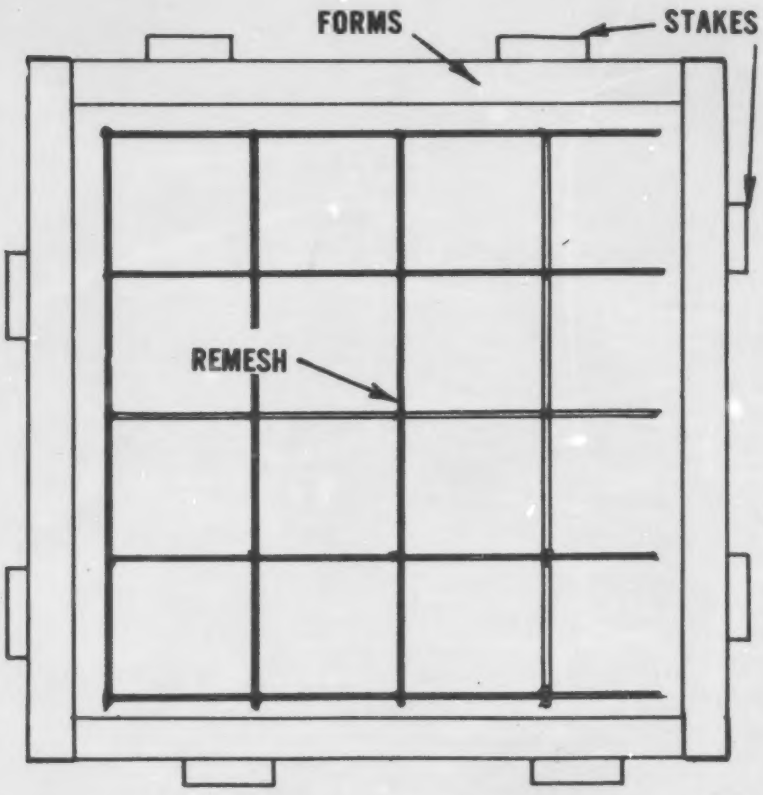
E. Drive 2 stakes in at one corner as shown below



F. Check outside corners for squareness

G. Drive in other 6 stakes

H. Place remesh in form as shown below



UNIT II

CONCRETE FINISHING

JOB SHEET 2--POUR AND FINISH A FLAGSTONE

I. Tools and materials

A. Sand

B. Gravel

C. Cement

D. Water

E. Wheelbarrow

F. Shovel

G. Hammer

H. Screed

I. Cement edger

J. Trowel

II. Procedure

A. Prepare the concrete

1. Mix sand, gravel, and cement in proper proportions in wheelbarrow

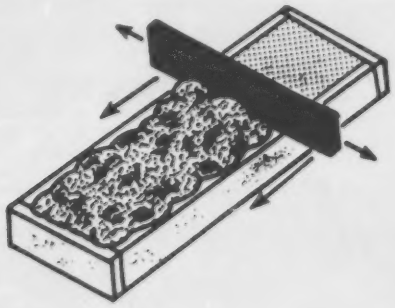
2. Add proper amount of water

3. Mix thoroughly until all lumps and dry pockets are blended

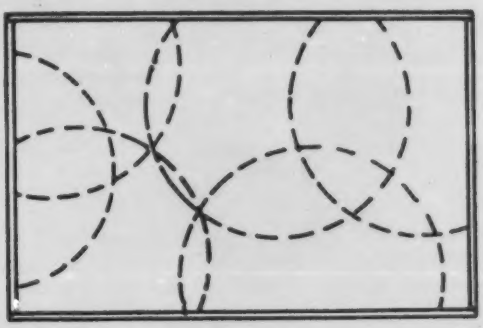
B. Pour the mix

1. Vibrate by striking without moving form

2. Screed surface of concrete



3. Trowel surface of concrete in overlapping semi-circles



4. Edge, using cement edger
5. Trowel again, if necessary
6. Clean tools and equipment

C. Remove the forms when the concrete has hardened.

1. Pull duplex nails from form
2. Tap stakes from side to side until loose in soil
3. Pull stakes out of ground
4. Tap forms and remove from flagstone
5. Push loose dirt into stake holes with shovel

D. Clean up area

UNIT II

CONCRETE FINISHING

TEST PART 1

1. Match terms associated with concrete finishing to the correct definition by writing the number of each term on the right in the correct blank on the left.

_____a.	A nail with a double head used in form construction	1. Tie wire
_____b.	Wire used to tie rebar together	2. Knee boards
_____c.	A straight piece of material used to level wet concrete	3. Cement
_____d.	Boards a worker kneels on while working wet concrete	4. Fill sand
_____e.	A bonding material that hardens when mixed with water	5. Duplex
_____f.	The base used under slabs to bring the ground level to the desired height.	6. Screed

2. Identify the materials used for site preparation by circling the answer that best completes each statement below.

   a. The lumber that holds wet concrete in place until it dries is called _____.

      (1) grade stakes
      (2) form
      (3) spreaders

   b. The _____ provides a cushion for a slab.

      (1) reinforcement mesh
      (2) cement
      (3) fill sand

   c. The _____ stakes hold the forms in place while the concrete dries.

      (1) grade
      (2) form
      (3) steel

TEST

d. The worker pouring the concrete can determine the thickness of the concrete by watching the _____.

(1) concrete
(2) forms
(3) grade stake

e. _____ are used to hold forms apart while pouring concrete.

(1) braces
(2) bars
(3) spreaders

3. Determine the proper composition of concrete by placing the correct number in the blank beside each part.

a. _____ part(s) of portland cement

b. _____ part(s) of sand

c. _____ part(s) of gravel

UNIT II

CONCRETE FINISHING

TEST PART 2

1. Match the terms associated with concrete pouring and finishing to the correct definition by placing the number of each term on the right in the correct blank.

_____a.	Leveling the surface of wet concrete after pouring	1. Vibrating
_____b.	A process used to remove air bubbles from wet concrete	2. Troweling
_____c.	Putting grooves in a slab to control cracking	3. Curing
_____d.	Rounding the edge of a slab to prevent chipping	4. Jointing
_____e.	Makes a smooth surface on concrete	5. Floating
_____f.	A process within the concrete that makes it solid	6. Jitterbugging
_____g.	Brings water and cement to the surface of a slab	7. Screeding
_____h.	Pushes the gravel below the surface of wet concrete	8. Edging
_____i.	Putting the final shape and surface on uncured concrete	9. Pouring
_____j.	Placing mixed concrete into the forms	10. Finishing

2. Identify the tools used for working concrete by writing the name of each listed below in the correct blank.

Wheelbarrow
Shovel
Jitterbug

Bullfloat
Concrete placer
Knee pads

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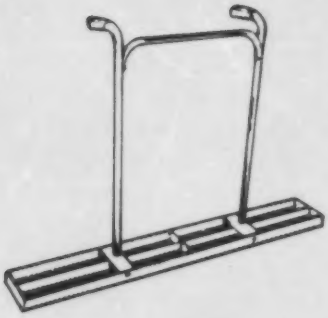
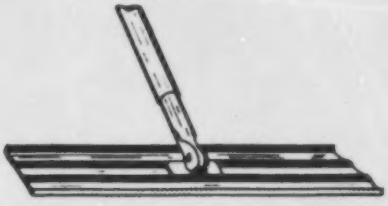
a. _____ b. _____

c. _____



d. _____

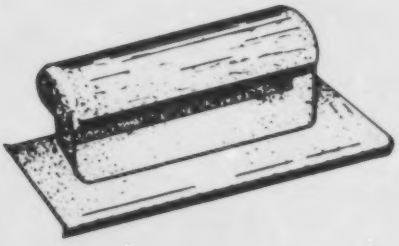
e. _____



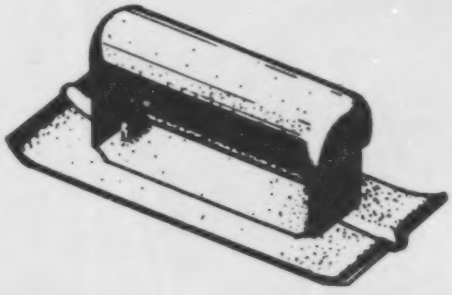
f. _____

3. Identify the tools used to finish concrete by writing the name of each listed below in the correct blank.

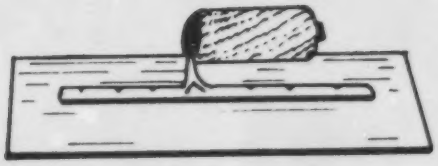
Inside corner trowel	Groover
Outside corner trowel	Hand trowel
Cement edger	Power trowel



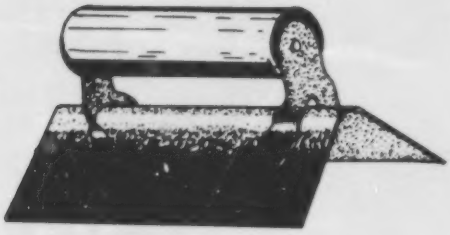
a. _____

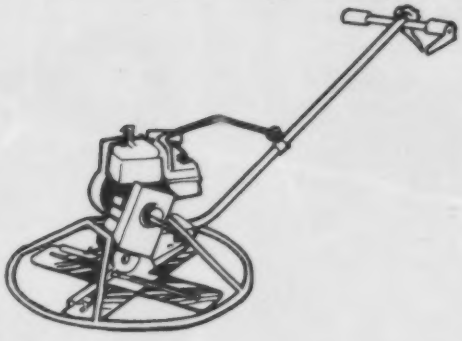


b. _____



c. _____ d. _____





e. _____ f. _____

4. Select the correct methods of finishing concrete by writing "True" or "False" in front of each statement below.

_____a. A vibrator is used by placing it on the forms.

_____b. A screed is moved from side to side as it moves forward.

_____c. The finisher should always move forward when "jitterbugging."

_____d. Wet concrete should be floated until dry.

_____e. Kneeboards should be used when floating wet concrete.

_____f. Concrete must begin to set up before troweling.

_____g. Troweling is done by straight line movements of the trowel.

_____h. The amount of pressure on the trowel depends on how much the concrete has set up.

TEST

5. Point out the things the finisher should consider before pouring and finishing concrete by placing an "X" in front of each correct statement below.

_____a. The corner farthest from the concrete truck should be poured first.

_____b. The forms should be filled to the top edge.

_____c. The beams of a slab should be poured first.

_____d. Concrete should be dried slowly.

_____e. Concrete should not be allowed to freeze before it has set up.

_____f. Concrete should be allowed to set up for 2 days before working on it.

UNIT II

CONCRETE FINISHING

ANSWERS TO ASSIGNMENTS

Assignment Sheet 1

(NOTE: The description of the use of the tools should be evaluated to the satisfaction of the instructor.)

A. Concrete placer

B. Bull float

C. Jitterbug

D. Wheelbarrow

E. Cement edger

F. Cement groover

G. Trowel

Assignment Sheet 2

A. 7.41 cubic yards

$333.33

B. 4.17 cubic yards

$195.99

C. 22.22 cubic yards

$777.70

UNIT II

CONCRETE FINISHING

ANSWERS TO TEST

Part 1

1. a. 5
   b. 1
   c. 6
   d. 2
   e. 3
   f. 4

2. a. 2
   b. 3
   c. 2
   d. 3
   e. 3

3. a. 1
   b. 2
   c. 3

Part 2

1. a. 7
   b. 1
   c. 4
   d. 8
   e. 2
   f. 3
   g. 5
   h. 6
   i. 10
   j. 9

2. a. Wheelbarrow
   b. Shovel
   c. Concrete placer
   d. Jitterbug
   e. Kneepads
   f. Bullfloat

3. a. Edger
   b. Groover
   c. Inside corner trowel
   d. Hand trowel
   e. Outside corner trowel
   f. Power trowel

4. a. False
   b. True
   c. False
   d. False
   e. True
   f. True
   g. False
   h. True

5. a. X
   b. X
   c. X
   d. X
   e. X
   f. X

ANSWERS TO TEST

UNIT III

MASONRY TOOLS AND MATERIALS

UNIT OBJECTIVE

After completing this unit, the student will be able to identify the tools and materials used in masonry work. This knowledge will be evidenced through demonstration and by satisfactorily completing the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student will be able to:

1. Match terms and definitions associated with masonry tools.
2. Identify masonry hand tools.
3. Select masonry equipment used in masonry construction.
4. Identify power equipment used in masonry construction.
5. Match the terms associated with masonry materials to the correct materials.
6. List three types of brick used in masonry construction.
7. Identify the characteristics of concrete blocks.
8. List three kinds of stone used in masonry construction.

UNIT III

MASONRY MATERIALS

SUGGESTED TEACHING PRODECURES

I. Objective Sheet

A. Discuss Unit Objectives with student.

B. Discuss each specific objective with the student.

C. Have student complete the objectives in the most logical sequence for the shop organization.

D. Add any necessary objectives.

II. Information Sheets

A. INFORMATION SHEET 1--TOOLS

1. This information introduces new terms and the tools used in masonry.

2. If the tools are available show a sample of the tool as it is introduced.

B. INFORMATION SHEET 2--MATERIALS

1. This information sheet introduces the materials used in masonry construction.

2. A walking tour of masonry buildings ,or a slide presentation can be used to reinforce the terms introduced in this unit.

3. A field trip to a masonry manufacturer or sales yard would be beneficial.

III. Transparency Masters

(NOTE: Transparency masters are included in the student manuals)

A. III-TM-1--MODULAR BRICK SHAPES

B. III-TM-2--MODULAR BRICK SIZES

C. III-TM-3--TYPES OF CONCRETE BLOCKS

D. III-TM-4--DESIGNER CORE BLOCKS

IV. Assignment Sheets

A. ASSIGNMENT SHEET 1--IDENTIFY MASONRY MATERIALS

1. This sheet provides a quick test to assist in

learning the names of common masonry materials.

2. This sheet can be used as a quick exam or an activity to introduce the topic.

B. ASSIGNMENT SHEET 2--SURVEY OF MASONRY MATERIALS

1. This sheet introduces an identification of masonry construction.

2. Use pictures of walls or buildings if it is not practical to visit actual buildings.

V. Unit Test

A. The unit test is divided into two parts to correspond with the information sheets.

B. The instructor may wish to vary the questions to make them compatible with the instructional program.

VI. Answers to Unit Test

VII. References:

A. Kicklighter, Clois E. Modern Masonry. South Hollond, Illinois: Goodheart-Wilcox Co., Inc., 1977.

B. Krek, Sr., R. T. Masonry Skills. Albany, New York: Delmar Publishers, 1976.

C. Dalzell, Ralph J., and Gilbert Townsend. Masonry Simplified. Chicago, Illinois: American Technical Society, 1970.

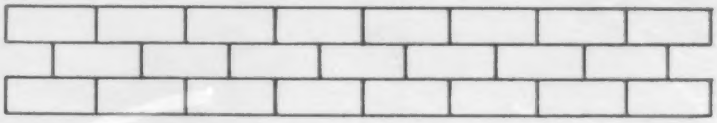
UNIT III

MASONRY TOOLS AND MATERIALS

INFORMATION SHEET 1--TOOLS

I. Terms and definitions

A. Course--A layer of bricks, blocks, or stones in a wall



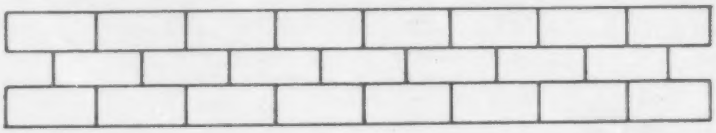
B. Joint--The space filled with mortar between each brick

C. Plumb--Means a wall is straight up and down and level

D. Bed joint--The horizontal mortar joint between each layer or course of bricks

E. Head joint--The vertical mortar joint between the ends of each brick

EXAMPLE:



F. Tuck pointing--Putting fresh mortar into defective joints

G. Muriatic acid--An acid combined with water and used to remove mortar from masonry

II. Masonry hand tools

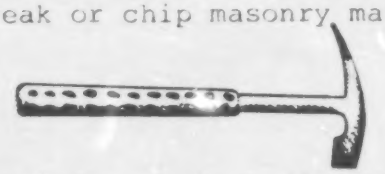
A. Laying tools

1. Trowel--Used to lay and spread mortar

2. Brick chisel--A sharp tool used to cut brick to correct dimensions

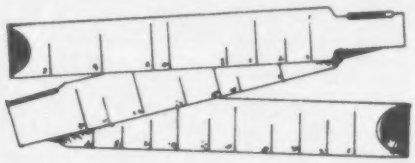
   (NOTE: Also called mason's chisel.)

3. Brick hammer--Used to strike brick chisels and break or chip masonry materials

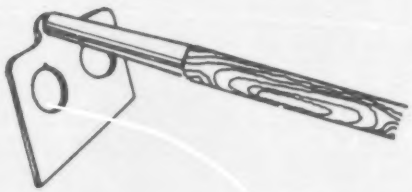


4. Mason's level--A 42-to 48-inch straightedge tool used to plumb a wall

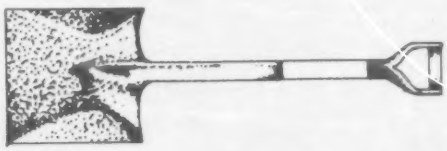
5. Spacing rule--A folding rule used to determine course height



6. Mortar hoe--A long-handled tool used to mix mortar

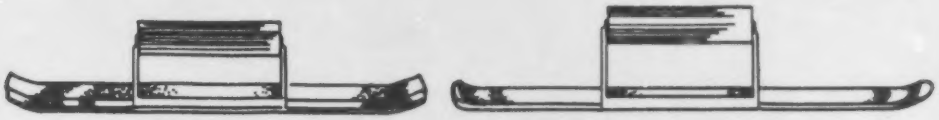


7. Shovel--Used to move masonry materials such as sand and mortar

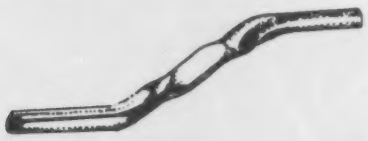


B. Finishing tools

1. Jointers--Used to finish the surface of mortar joints

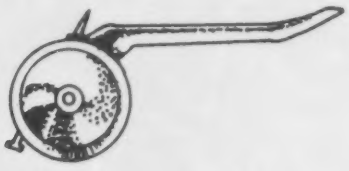


a. Sled runner-- Used to finish the bed joints



b. S-shaped--Used to finish the head joints

2. Joint raker--Used to finish the joints just before the mortar hardens



3. Tuck pointer joint filler--Used to put fresh mortar in joints that need repair

4. Mason's utility brush--Use to brush off excess mortar after jointing

5. Acid brush--Used with muriatic acid to remove mortar

6. Brush brick--Used to remove dried excess mortar

III. Masonry equipment

A. Wheelbarrows (Transparency #1)

1. Contractor's wheelbarrow--Used to move materials such as sand and mortar

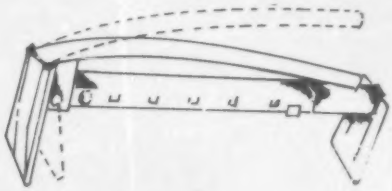
2. Wooden wheelbarrow--Used to move materials such as concrete blocks and bricks

B. Mortar box--Used to hold mortar for mixing

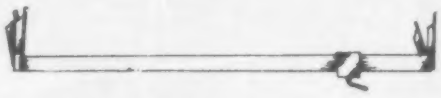
C. Mortar stand--Used to hold mortar within easy reach of mason

D. Scaffolds--Used to support the mason and materials being used (Transparency #2)

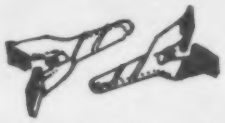
E. Brick tongs--Used to carry several bricks at a time



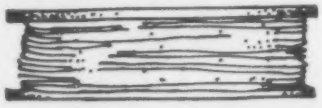
F. Corner poles--Used to hold a line for proper spacing of each course of bricks



G. Corner blocks--Used to hold the mason's line



H. Mason's line--A length of nylon string used to keep courses level and even



I. Rubber gloves--Waterproof gloves that are worn to protect hands when working with muriatic acid

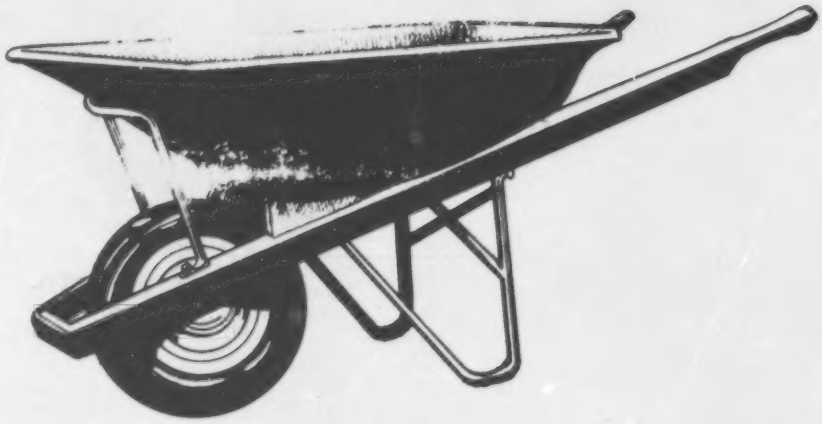
J. Bucket--Metal or plastic, used for mixing water and muriatic acid

IV. Power masonry equipment (Transparency #3)

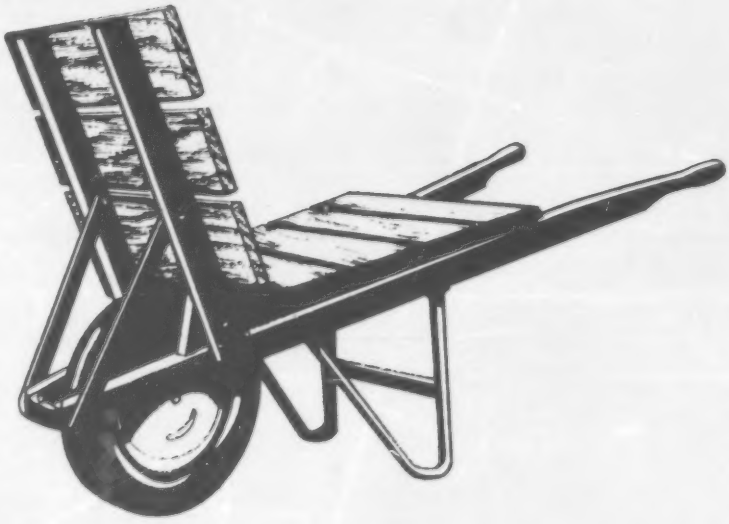
A. Mortar mixer--Used to mix medium size amounts of mortar

B. Masonry saw--Used to cut masonry blocks and bricks

WHEELBARROWS



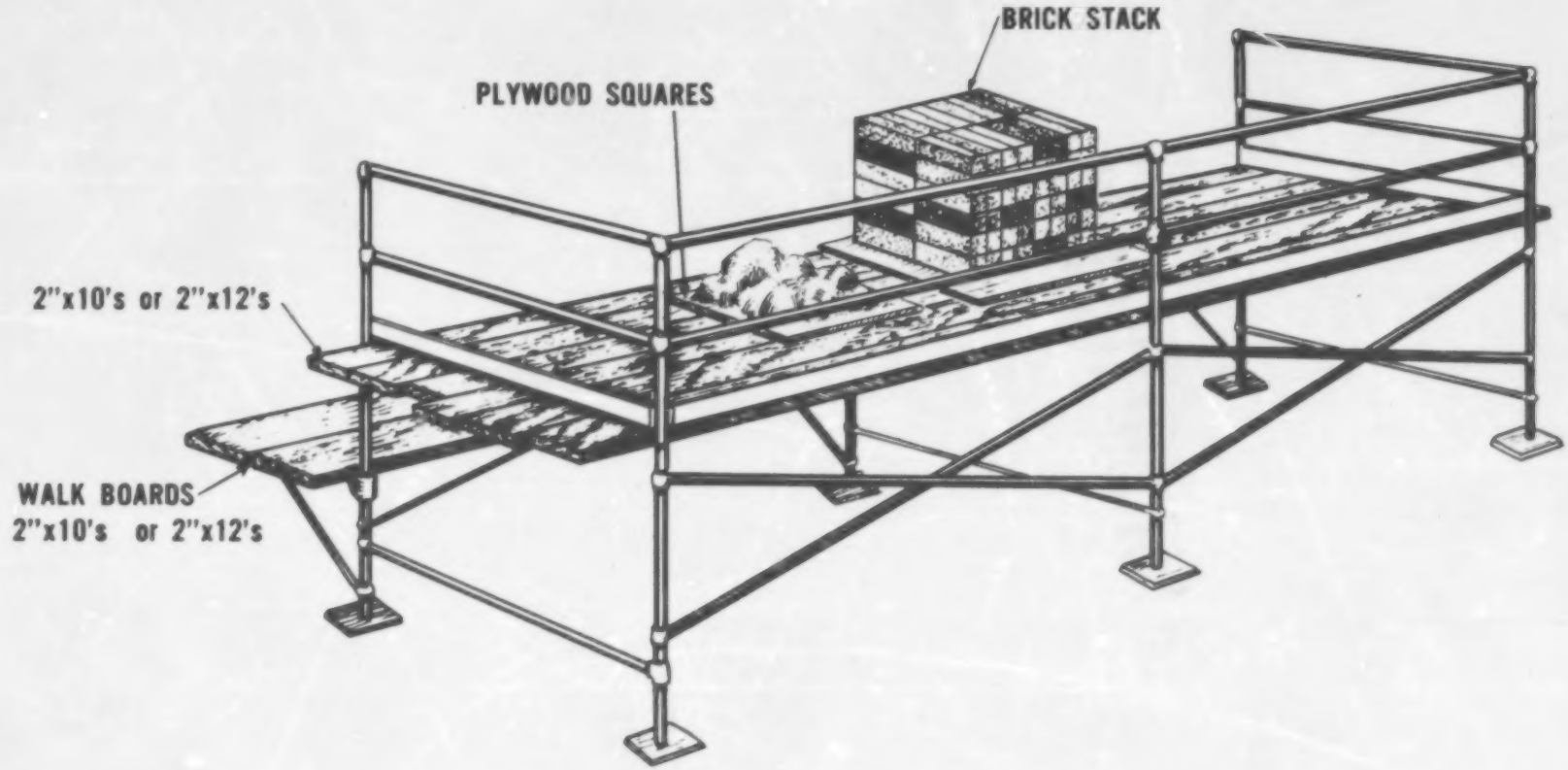
CONTRACTOR'S WHEELBARROW



WOODEN WHEELBARROW

TM-1

SCAFFOLDS



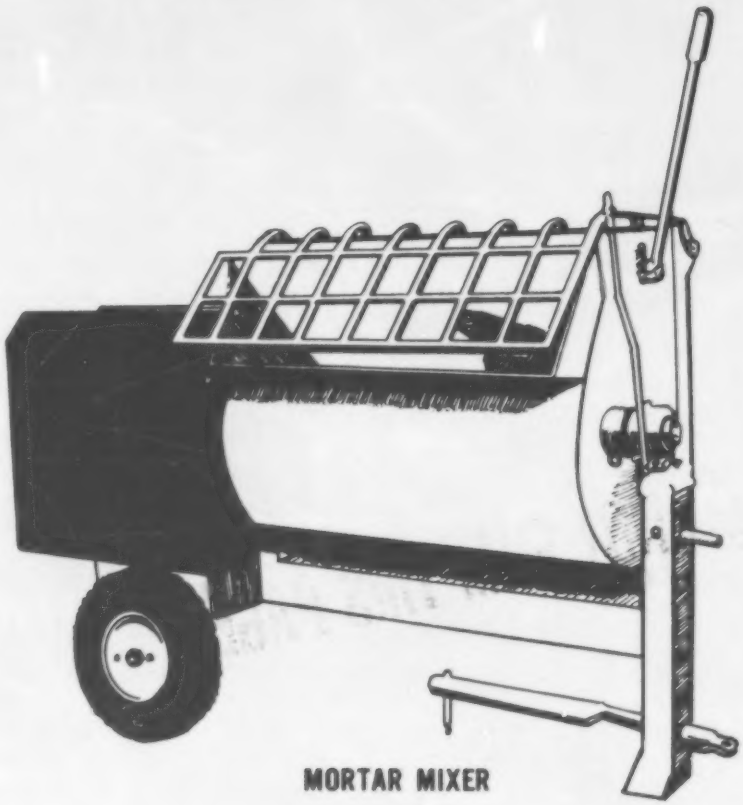
TM-2

76

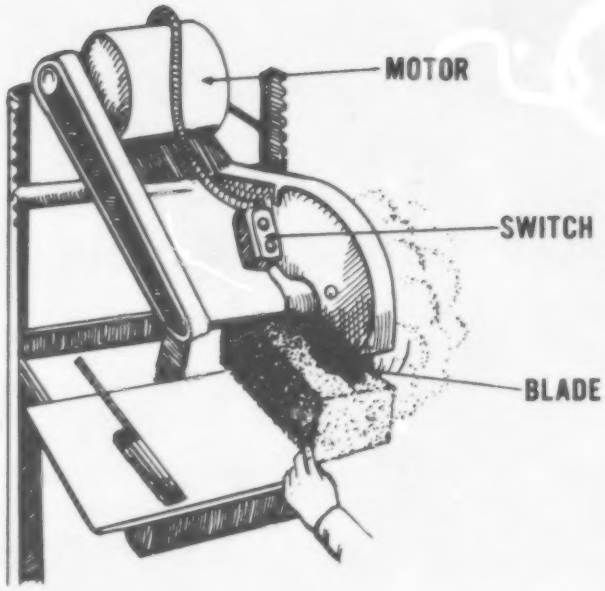
77

85

POWER MASONRY EQUIPMENT



MORTAR MIXER



MORTAR SAW

TM-3

UNIT III

MASONRY TOOLS AND MATERIALS

ASSIGNMENT SHEET 1--IDENTIFY MASONRY HAND TOOLS

Directions: The instructor will prepare a display of each tool listed in Part II of the Information Sheet. Each tool will be assigned a number only. On a sheet of paper, write the correct name of each tool beside the number of that tool.

(NOTE: The instructor may provide a list of masonry tools from which you can select your answers.)

ASSIGNMENT

UNIT III

MASONRY TOOLS AND MATERIALS

ASSIGNMENT SHEET 2--SURVEY OF MASONRY MATERIALS

Directions: Survey the shop and classroom. On a sheet of paper, list all the different types of masonry materials you can identify. Try to determine in what class each material would be listed. Below is an example of how your list might appear.

Shop:	Exterior	Interior
North wall -	Common brick	Standard block Hollow load bearing
East wall -	Common brick	Standard block Hollow load bearing
South wall -	Standard block Nonload bearing	Standard block Nonload bearing
West wall -	Standard block Nonload bearing	Standard block Nonload bearing

ASSIGNMENT

UNIT III

MASONRY TOOLS AND MATERIALS

ASSIGNMENT SHEET 3--IDENTIFY MASONRY EQUIPMENT AND POWER EQUIPMENT

Directions: The instructor will prepare a display of each item listed in Parts III and IV of the Information Sheet. Each item will be assigned a number only. On a sheet of paper, write the correct name of each item beside the number of that piece of equipment.

(NOTE: The instructor may provide a list of masonry equipment terms from which you can select your answers.)

UNIT III

MASONRY TOOLS AND MATERIALS

INFORMATION SHEET 2--MATERIALS

I. Terms and definitions

A. Kiln--A large oven used to burn or "fire" bricks

B. Brick--A masonry unit made of clay or shale and fired in a kiln

C. Concrete block--A solid or hollow masonry unit made of concrete

D. Nominal--The actual size of a brick plus the thickness of the mortar joint

E. Modular--Brick sizes that make estimating the number of bricks needed easier

F. Ceramic--A high gloss finish that is baked on in a kiln

II. Bricks

A. Types

1. Face brick--Used for good appearance where a wall will be seen

2. Common brick--Used where strength is needed

(NOTE: Common brick is also called building brick.)

3. Fire brick--Used in places exposed to high heat, such as fireplaces

B. Sizes and shapes (TM-3 and TM-4)

1. Thickness varies from about 3 to 12 inches

2. Height varies from about 2 to 8 inches

3. Length can be up to 16 inches

4. Most bricks are modular sized

C. Colors

1. Range from white to yellow in the light colors

2. Range from tan to dark red in the dark colors

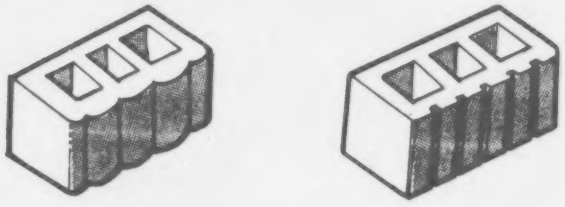
3. Mineral additives are used to change colors before the brick is fired

III. Concrete blocks

A. Types (TM-5)

1. Standard lightweight--Used for flat surface walls

2. Textured--Design blocks used for decorative walls



3. Glazed face--Has ceramic surface that resists water and chemicals

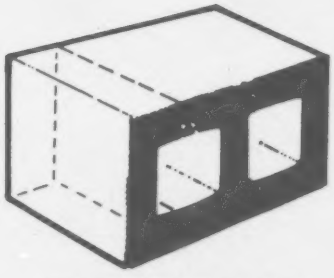
4. Designer core--Used for decorative walls that control noise and light (TM-6)

B. Classes of blocks

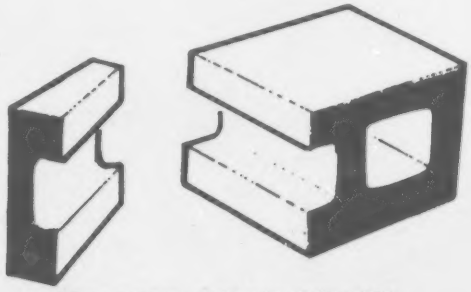
1. Solid load-bearing

a. Used to support heavy loads, such as roof structures

b. Not more than 25% of cross-sectional area is hollow



CROSS-SECTION CUT



LESS THAN 25% IS HOLLOW

2. Hollow load bearing

   a. Used to support most common building loads

   b. 40 % to 50% of cross-sectional area is hollow

3. Hollow nonload bearing

   a. Thin-shelled and lightweight

   b. Use in nonload bearing-walls

C. Sizes

BLOCK	MANUFACTURED SIZE			JOINT SIZE	NOMINAL SIZE		
	t	h	l		t	h	l
12 in.	7 5/8	7 5/8	11 5/8	3/8	8	8	12
16 in.	7 5/8	7 5/8	15 5/8	3/8	8	8	16

(NOTE: Thickness can vary from 4 to 12 inches.)

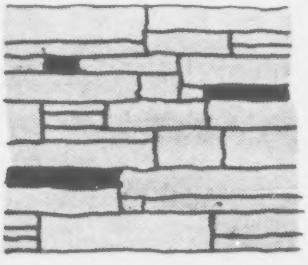
IV. Stone

A. Flagstone

1. Large, flat rock

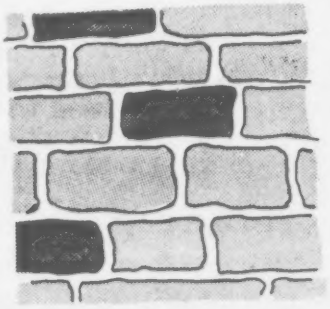
2. Generally 3 to 4 inches thick

3. Laid on edge



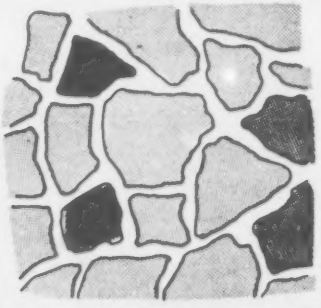
B. Cut stone

1. Large, flat rock
2. Cut to 3 to 4 inches wide
3. Laid with edges exposed

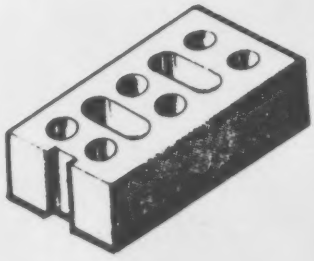


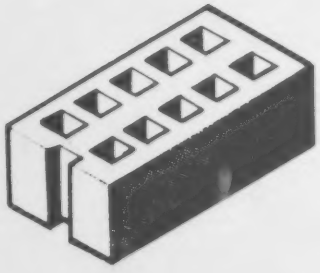
C. Rubble stone

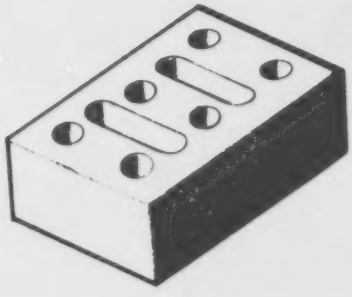
1. Large and irregular in shape
2. Used to build thick, strong walls

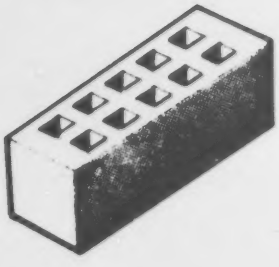


MODULAR BRICK SHAPES









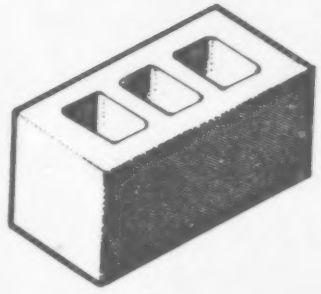
TM-4

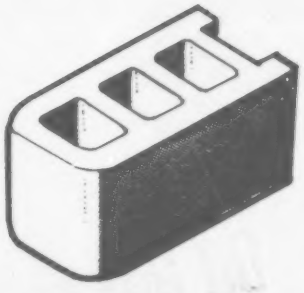
MODULAR BRICK SIZES

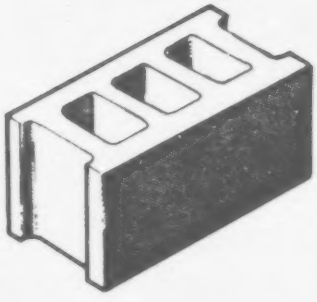
UNIT DESIGNATION	NOMINAL DIMENSIONS, IN.			JOINT THICKNESS IN.	MANUFACTURED DIMENSIONS IN.		
	t	h	l		t	h	l
STANDARD MODULAR	4	2 2/3	8	3/8	3 5/8	2 1/4	7 5/8
				1/2	3 1/2	2 1/4	7 1/2
ENGINEER	4	3 1/5	8	3/8	3 5/8	2 13/16	7 5/8
				1/2	3 1/2	2 11/16	7 1/2
JUMBO	4	4	8	3/8	3 5/8	3 5/8	7 5/8
				1/2	3 1/2	3 1/2	7 1/2
DOUBLE	4	5 1/3	8	3/8	3 5/8	4 15/16	7 5/8
				1/2	3 1/2	4 13/16	7 1/2
ROMAN	4	2	12	3/8	3 5/8	1 5/8	11 5/8
				1/2	3 1/2	1 1/2	11 1/2
NORMAN	4	2 2/3	12	3/8	3 5/8	2 1/4	11 5/8
				1/2	3 1/2	2 1/4	11 1/2
NORWEGIAN	4	3 1/5	12	3/8	3 5/8	2 13/16	11 5/8
				1/2	3 1/2	2 11/16	11 1/2
TRIPLE	4	5 1/3	12	3/8	3 5/8	4 15/16	11 5/8
				1/2	3 1/2	4 13/16	11 1/2
SCR BRICK	6	2 2/3	12	3/8	5 5/8	2 1/4	11 5/8
				1/2	5 1/2	2 1/4	11 1/2

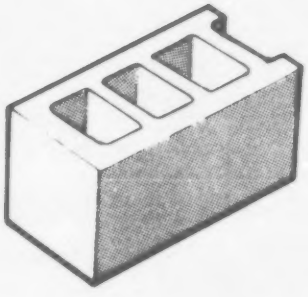
TM-5

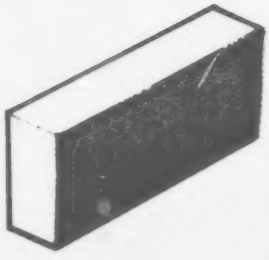
TYPES OF CONCRETE BLOCKS

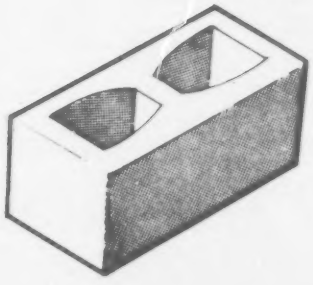




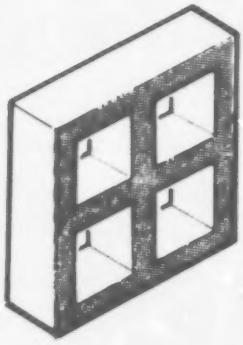


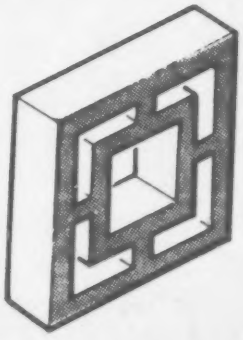


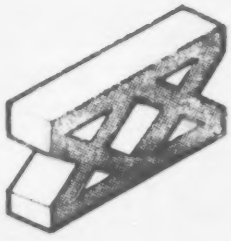


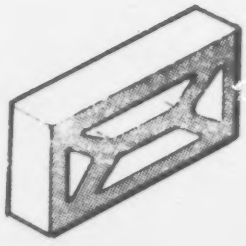


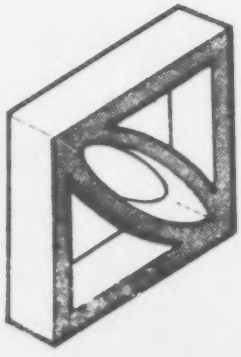
DESIGNER CORE BLOCKS

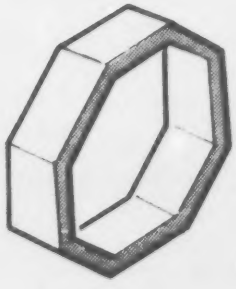












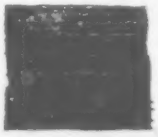
UNIT III

ASSIGNMENT SHEET 4--IDENTIFY MASONRY MATERIALS

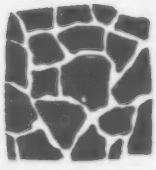
Directions: Identify the type of masonry materials shown below. Choose your answer from the following list:

Flagstone	Brick
Concrete block	Cut stone
Rubble stone	Designer block

A. _____

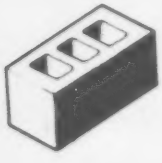


B. _____

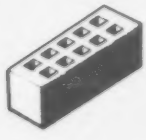


C. _____

D. _____



E. _____



F. _____

UNIT III

MASONRY TOOLS AND MATERIALS

TEST PART 1

1. Match the masonry terms on the right to the correct definition on the left by placing the number in the blank.

_____a.	The space filled with mortar between each brick	1. Tuck pointing
_____b.	Means a wall is straight up and down and level	2. Head joint
_____c.	The vertical mortar joint between the ends of each brick	3. Bed joint
_____d.	Putting fresh mortar into defective joints	4. Plumb
_____e.	The horizontal mortar joint between each layer or course of bricks	5. Joint
_____f.	A layer of bricks, blocks or stones in a wall	6. Course

2. Identify the following masonry hand tools and either a "laying tool" or "finishing tool" by writing either the word "laying" or "finishing" in the blank below each tool.

a. _____

Trowel

b. _____

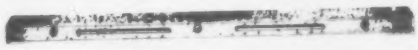
Brick chisel

c. _____

Brick hammer

d. _____

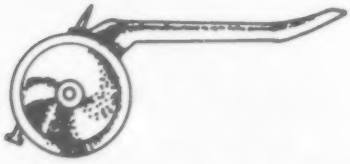
Mason's level



TEST

e. _____

Joint raker



f. _____

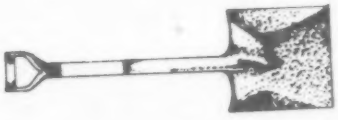
Tuck pointer joint filler

g. _____

Mortar hoe

h. _____

Shovel

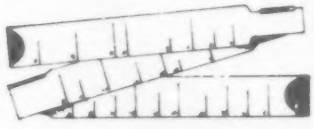


i. _____

Mason's utility brush

j. _____

Spacing rule



k. _____

Brick brush

l. _____

Acid brush

3. Select the items below that are masonry equipment by placing a "✓" in the blank.

_____a. Mortar box

_____b. Wooden wheelbarrow

_____c. Brick tongs

_____d. Jack plane

_____e. Scaffolds

_____f. Masons line

_____g. Rubber gloves

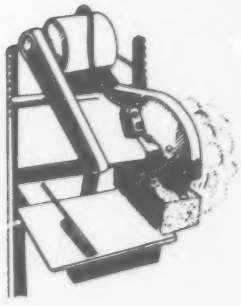
_____h. Corner blocks

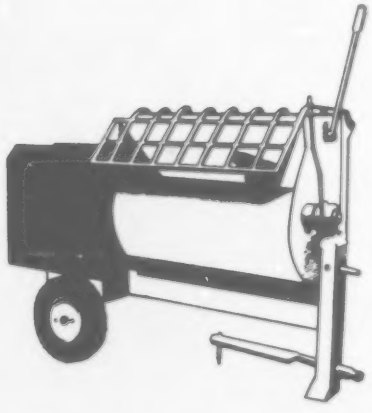
_____i. Crosscut saw

_____j. Corner poles

4. Identify the masonry power equipment below.

a. _____ b. _____





UNIT III

MASONRY TOOLS AND MATERIALS

TEST PART 2

1. Match the masonry terms in the right hand column to the correct definition of the left. Place the number in the blank.

_____a.	The actual size of a brick plus the thickness of the mortar joint	1. Ceramic
_____b.	A large oven used to burn or "fire" bricks	2. Brick
_____c.	A solid or hollow masonry unit made of concrete	3. Kiln
_____d.	A high gloss finish that is baked on in a kiln	4. Nominal
_____e.	A masonry unit made of clay or shale and fired in a kiln	5. Modular
_____f.	Brick sizes that make estimating the number of bricks needed easier	6. Concrete block

2. List three types of bricks used in masonry construction.

a.

b.

c.

3. Identify the characteristics of concrete blocks by placing a "√" in the blank in front of each correct statement.

_____a. Designer core blocks are used for decorative walls and to control noise and light.

_____b. Glazed face blocks have ceramic surfaces that resist water and chemicals.

_____c. Solid load-bearing blocks are not more than 40% hollow in a cross-sectional area.

TEST

_____d. Hollow nonload bearing blocks are thin and lightweight.

_____e. Thickness of concrete block can vary from 4 to 12 inches.

4. List three kinds of stone used in masonry construction.

a.

b.

c.

UNIT III

MASONRY TOOLS AND MATERIALS

ANSWERS TO ASSIGNMENTS

Assignment Sheets 1, 2, and 3

(NOTE: The description of the use of the tools should be evaluated to the satisfaction of the instructor.)

Assignment Sheet 4

A. Designer block

B. Flagstone

C. Rubble stone

D. Cut Stone

E. Concrete block

F. Brick

UNIT III

MASONRY TOOLS AND MATERIALS

ANSWERS TO TEST

Part 1

1. 5 a.
4 b.
2 c.
1 d.
3 e.
6 f.

2. a. laying
b. laying
c. laying
d. laying
e. finishing
f. finishing
g. laying
h. laying
i. finishing
j. laying
k. finishing
l. finishing

3. ✓ a.
✓ b.
✓ c.
d.
✓ e.
✓ f.
✓ g.
✓ h.
i.
✓ j.

4. a. Masonry saw
b. Mortar mixer

Part 2

1. 4 a.
3 b.
6 c.
1 d.
2 e.
5 f.

2. a. face
b common
c. fire

3. ✓ a.
✓ b.
c.
✓ d.
✓ e.

4. a. Flagstone
b. Cut stone
c. Rubble stone

ANSWERS TO TEST

UNIT IV

MASONRY CONSTRUCTION

UNIT OBJECTIVE

After completion of this unit, the student will be able to prepare a mortar mix and construct a masonry wall. This knowledge will be evidenced through demonstration and by satisfactorily completing the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student will be able to:

1. Match terms associated with mortar preparation to the correct definition.
2. Identify the types of mortar mixes
3. Point out the things that the worker should consider when mixing mortar
4. Match the terms associated with masonry wall construction to the correct definition
5. List three types of masonry joints
6. Select the correct types of masonry joint finishes
7. Identify the positions for laying brick
8. Identify the kinds of brick courses
9. Identify the kinds of brick bonds
10. List two types of concrete block bonds
11. Point out the things to consider when laying a corner lead
12. Point out the considerations for laying a masonry wall
13. Demonstrate the ability to:
    a. Prepare a mortar mix
    b. Supply a mortar stand with mortar
    c. Spread mortar
    d. Lay a corner lead six courses high
    e. Complete a wall between corner leads

UNIT IV

MASONRY CONSTRUCTION

SUGGESTED TEACHING PROCEDURES

I. Objective Sheet

A. Discuss Unit Objective with student.

B. Discuss each specific objective with the student.

C. Have student complete the objectives in the most logical sequence for the shop organization.

D. Add any necessary objectives.

II. Information Sheet

A. INFORMATION SHEET 1--MORTAR PREPARATION

1. Use this sheet to introduce mortar, and the different types of mortar mix.

2. Discuss the various places where different types of mortar should be used.

B. INFORMATION SHEET 2--WALL CONSTRUCTION

1. Although the different methods of laying brick may not be of significance in masonry repair, this sheet may be used to introduce masonry construction.

2. Discuss the types of joints and point out the significance of each.

III. Transparency Masters

A. IV-TM-1--ABOVE GRADE-BELOW GRADE

B. IV-TM-2--METHODS OF MIXING MORTAR

C. IV-TM-3--NAMES OF BRICK POSITIONS

D. IV-TM-4--KINDS OF BRICK COURSES

E. IV-TM-5--KINDS OF BRICK BONDS

F. IV-TM-6--TYPICAL WALL SECTIONS

g. IV-TM-7--TYPICAL WALL SECTIONS WITH A WINDOW

IV. Job Sheets

A. JOB SHEET 1--PREPARE A MORTAR MIX

1. Assist students in preparing the first batch.

2. Observe the mixing procedure to assure complete and correct mixing.

B. JOB SHEET 2--SUPPLY A MORTAR STAND WITH MORTAR

1. This introduces the method of handling mortar.

2. Observe student activities to develop correct procedures.

C. JOB SHIET 3--SPREAD MORTAR

1. This procedure should be combined with laying brick.

2. Spreading mortar can be taught as bricks are being laid.

D. JOB SHEET 4--LAY A CORNER LEAD SIX COURSES HIGH

1. This introduces laying the corner leads.

2. Correct procedures at this phase determine the qualitity of the work.

E. JOB SHEET 5--COMPLETE A WALL BETWEEN CORNER LEADS

V. Unit Test

A. The unit test is divided into two parts.

B. The instructor may wish to add or delete questions from the test.

VI. Answers to Unit Test

VII. References:

A. Kicklighter, Clois E. Modern Masonry. South Hollond, Illinois: Goodheart-Wilcox Co., 1977.

B. Krek, Sr., R. T. Masonry Skills. Albany, New York: Delmar Publishers, 1976.

C. Dalzell, Ralph J., and Gilbert Townsend. Masonry Simplified. Chicago, Illinois: American Technical Society, 1970.

UNIT IV

MASONRY CONSTRUCTION

INFORMATION SHEET 1--MORTAR PREPARATION

I. Terms and definitions

A. Mortar--A mixture of portland cement, lime, sand, and water used for bonding brick

B. Caustic--Any material that can cause burns by chemical reaction, such as acid

C. Lime--A caustic material used in making mortar mix

D. Masonry cement--Pre-mixed portland cement and lime used in making mortar

E. Plastic mortar--Mortar that has just been mixed

F. Slump--The settling action of plastic mortar

G. Above grade--Above the level of the ground (TM-1)

H. Below grade--Below the level of the ground (TM-1)

I. Pre-mix--Two or more ingredients mixed and packaged by the manufacturer

J. Bond--To hold together

K. Compress--To push together

L. Consistency--How firm or watery the mortar is

II. Types of mortar mix

A. Pre-mixed

1. Consists of portland cement and lime in correct ratio

2. Needs only sand and water added to become mortar

B. On-the-job

1. Type M

a. Has high compressive strength

b. Used for exterior and below grade work

2. Type S

   a. Has high bonding strength

   b. Used for exterior and below grade work

3. Type N

   a. Used for general purpose

   b. Highly weather resistant

   c. For above-grade use, only

4. Type O

   a. Has low strength

   b. Used for interior work only

5. Type K

   a. Has very low strength

   b. Used for interior work only

   c. Will not support a load

III. Considerations for preparing mortar

A. Mortar materials

1. Sand

   a. Cleanliness

      (1) Should be free of trash, dirt, and rocks

      (2) Will not bond if dirty

   b. Sharpness

      (1) Must be sharp-edged to bond

      (2) Will slump and not bond if round

   c. Sized

      (1) Should have different sizes of sand mixed together

      (2) Small sizes fill in between larger sizes

MAGNIFIED VIEW OF SAND

2. Water

   a. Must be clean

   b. Will make weak mortar if dirty

B. Mortar mix formulas

1. Pre-mixed

   a. One part mortar mix,

   b. Three parts sand, and

   c. Water

2. On-the-job mix

PARTS BY VOLUME			
TYPE	PORTLAND CEMENT	HYDRATED LIME	SAND
M	1	1/4	2 1/2 to 3
S	1	1/4 to 1/2	times the total
N	1	1/2 to 1 1/4	amount of
O	1	1 1/4 to 1 1/2	cement and lime
K	1	2 1/2 to 4	

C. Methods of mixing (TM-2)

1. Using power mixer

   a. Follow the table for correct amounts of each mortar part

   b. Follow proper procedure for adding and mixing mortar parts

   c. Do not put shovel in mixer while mixer is turning

2. Hand mixing

   a. Follow the table for correct amounts of each mortar part

b. Follow proper procedures for adding and mixing mortar parts

c. Do not overfill mortar box

D. Caring for mixed mortar

1. Keep mortar in a tight pile

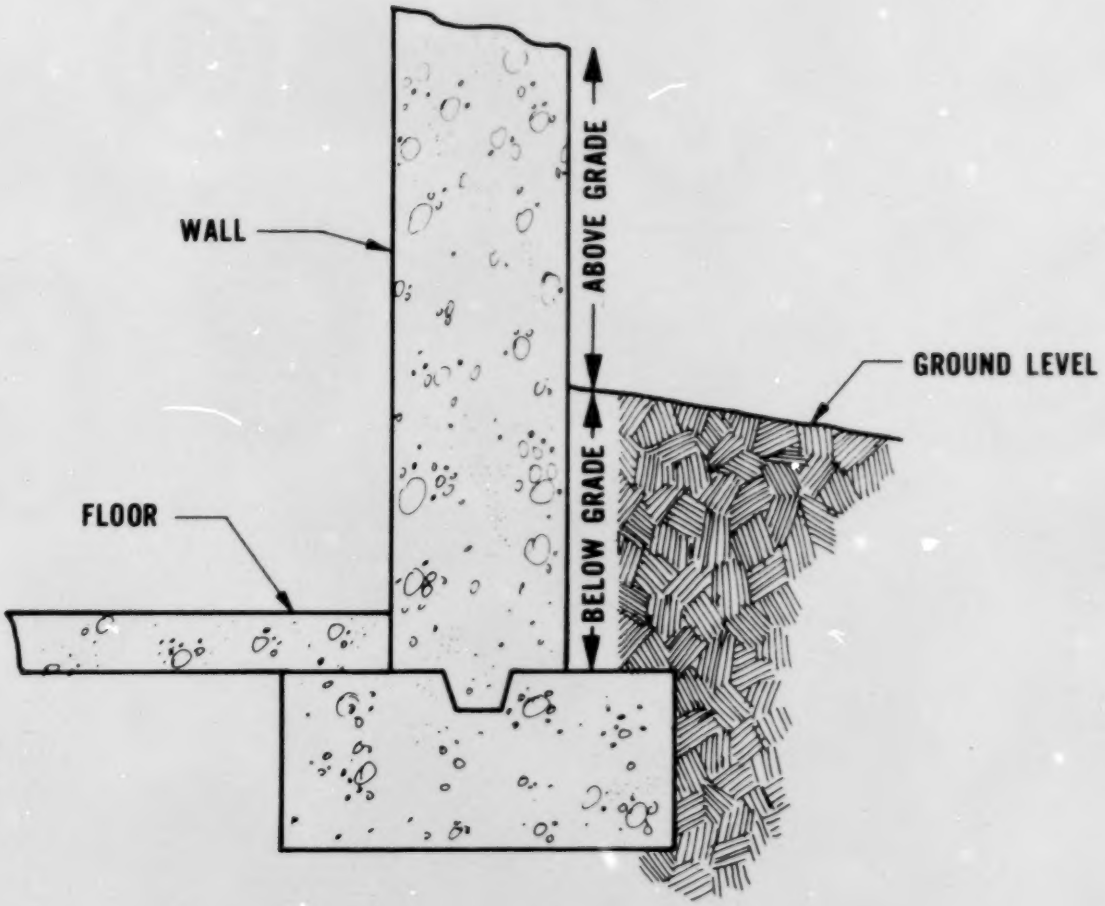
2. Sprinkle lightly with water in very hot weather

3. Re-mix every 5 to 10 minutes to keep proper consistency

4. Add water only when really necessary

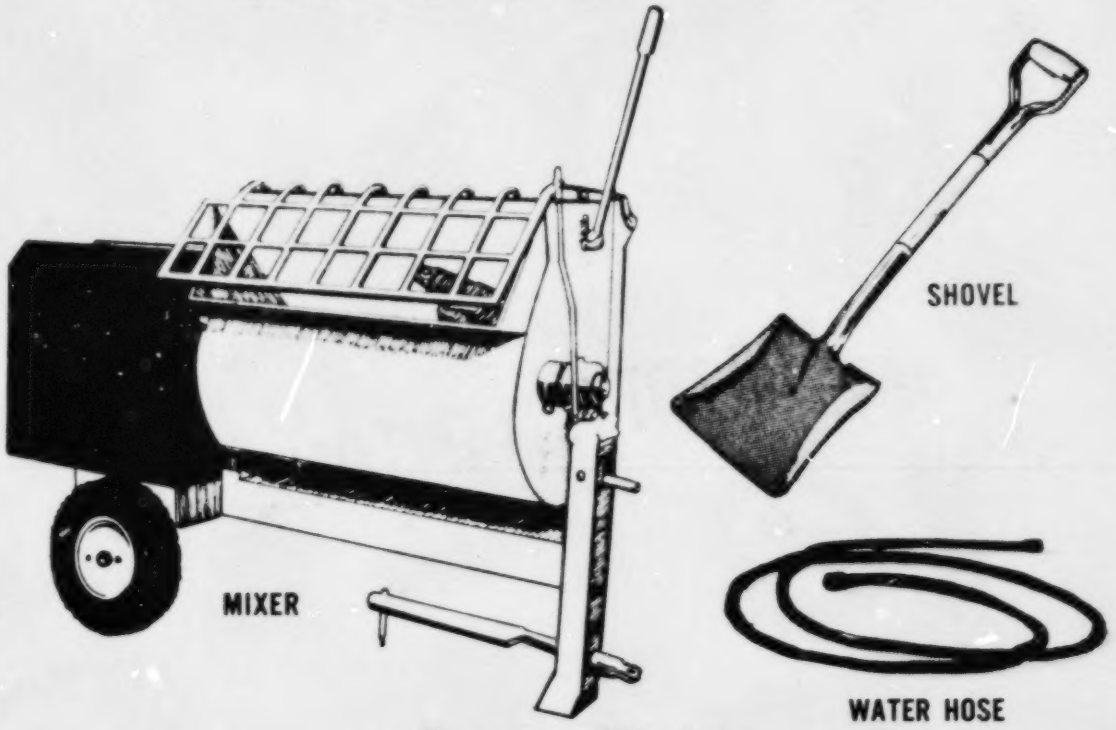
5. Wet mortar boards to keep board from drawing water from mortar

ABOVE GRADE–BELOW GRADE



TM-1

METHODS OF MIXING MORTAR



Power Mixing

Hand Mixing

TM-2

UNIT IV

MASONRY CONSTRUCTION

INFORMATION SHEET 2--WALL CONSTRUCTION

I. Terms and definitions

A. Wall ties--Metal strips used to hold a brick wall in place

B. Lead--The first part that is built in a masonry wall

C. Corner lead--Building the corners of masonry walls first

D. Closure brick--The last brick laid in a course

E. Course--A layer of bricks, blocks, or stones in a masonry wall

F. Lintel--A support for courses above wall openings

G. Frieze board--A board that is used for trim along the top of the last course

H. Corner pole--Any type of post which is propped and braced in a plumb position so a line can be fastened to it.

II. Types of masonry joints

A. Bed joint--The horizontal mortar joint between each course

(NOTE: Do not lay more than 10 courses in a wall before mortar has began to harden to prevent mortar from being pressed out of bottom joints.)

B. Head joint--The vertical mortar joint between the ends of each brick or block

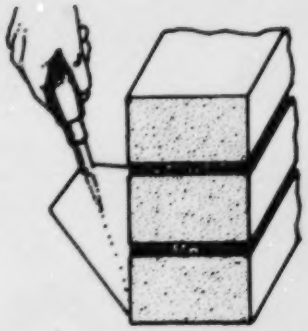
C. Closure joint--The mortar joint between the last brick laid in a course

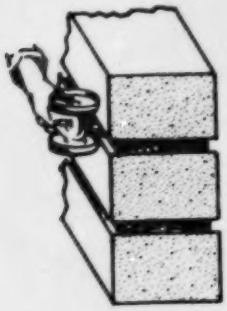
(NOTE: Check the last brick to be laid in a course for fit before applying mortar to closure joint.)

INFORMATION

III. Types of masonry joint finishes

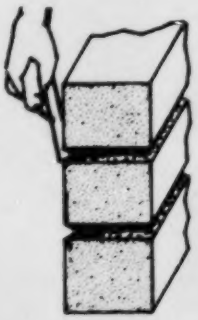
A. Flush--Mortar is removed with edge of trowel, leaving joint even with surface of brick





B. Raked--Mortar is raked out of joint to a depth of 3/8 inch using a wheel joint raker

C. "V"-groove--Mortar is smoothed into joint with either an S-shaped or sled runner tool with "V"-shaped edge



D. Concave--Mortar is smoothed into joint with either an S-shaped or sled runner tool with "U"-shaped edge

IV. Names of brick positions (TM-3)

A. Stretcher

B. Header

C. Sailor

D. Soldier

E. Rowlock

F. Rowlock stretcher

V. Kinds of brick courses (TM-4)

A. Stretcher--The straight running courses in a wall

(NOTE: Stretcher courses are also called bond courses.)

B. Soldier

1. Brick stood on end to finish top of wall

2. Allows for stretcher courses to be laid to the window openings

3. Allows for top course to be laid to the frieze board

C. Header

1. Courses that are turned crosswise in a double wall

2. Tie double walls together every sixth course

3. Used to cap the top of a double wall

D. Rowlock

1. Bricks are turned on edge

2. Used to cap double walls

3. Used to make window sills

INFORMATION

VI. Kinds of brick bonds (TM-5)

A. American

(NOTE: Also known as running bond.)

B. Flemish

C. English

D. Stack

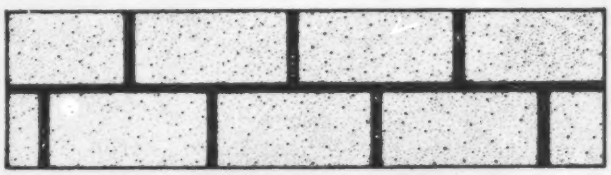
E. Common bond--Sixth course headers

VII. Concrete blocks

A. Joints--Same as for brick

B. Bonds

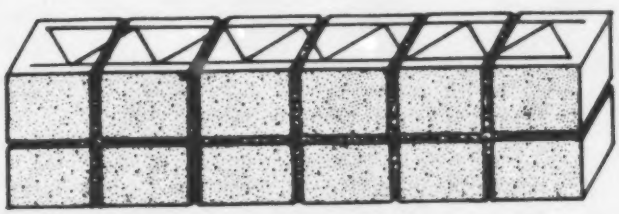
1. Straight--Should be laid with 1/2 overlap for maximum strength



2. Decorative

a. Used for beauty

b. Must be reinforced every second course



VIII. Considerations for laying corner leads (TM-6)

A. Corners are usually laid first when constructing a masonry wall.

B. Set the corner pole in place, and plumb this with the courses marked.

C. Lay the stretcher course first without mortar to check the spacing.

D. Mortar the corners in place first.

E. Check for plumb and level as the corner is being laid.

IX. Considerations for laying wall openings (TM-7)

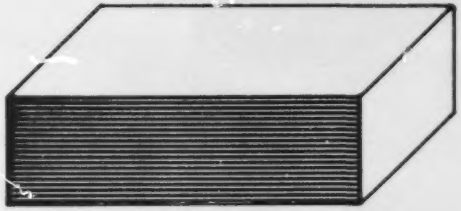
A. Establish location of openings.

B. Determine the size and height of openings.

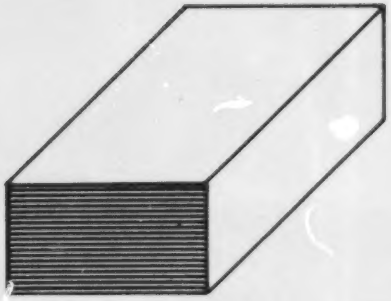
C. Adjust the course spacing to match wall openings.

D. Use angle iron for lintels over wall openings.

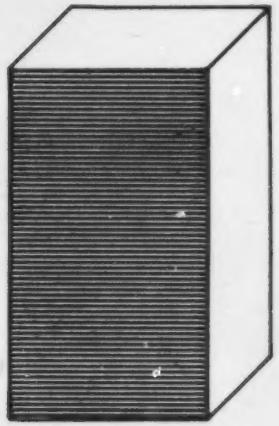
NAMES OF BRICK POSITIONS



STRETCHER

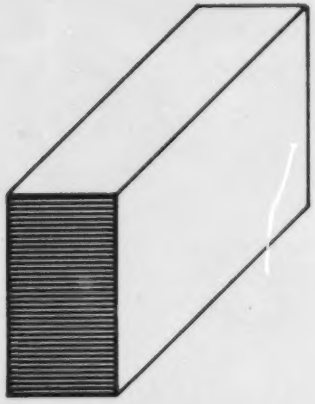


HEADER



SAILOR

SOLDIER



ROWLOCK

ROWLOCK STRETCHER

TM-3

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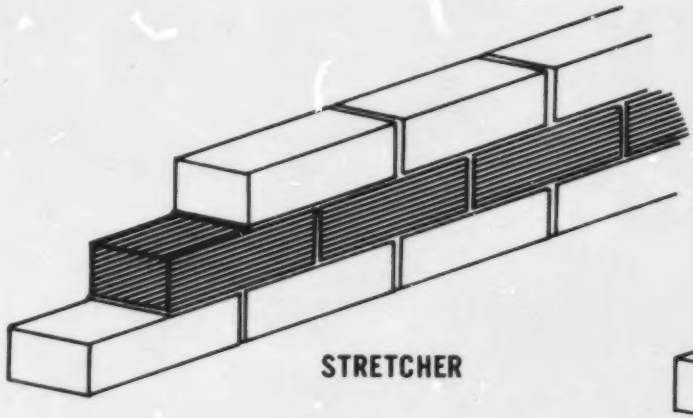
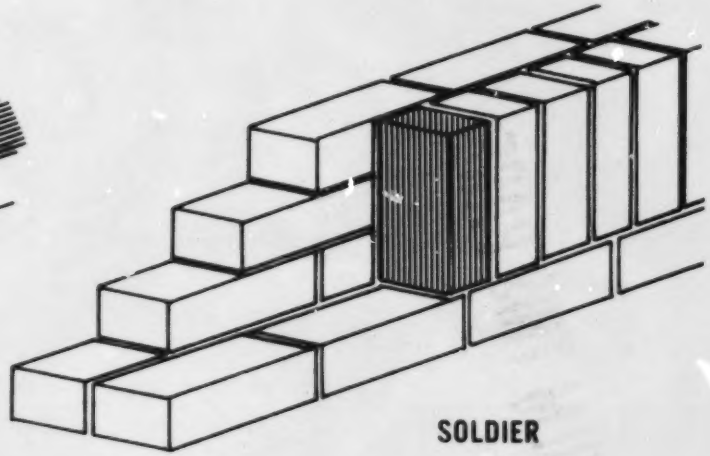
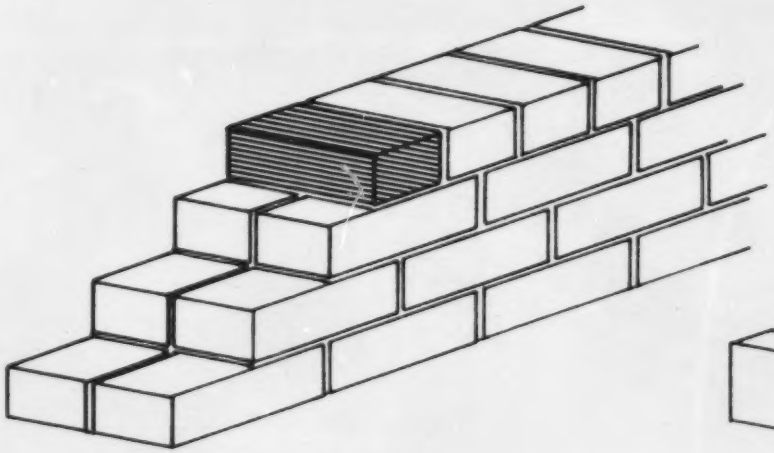
KINDS OF BRICK COURSES



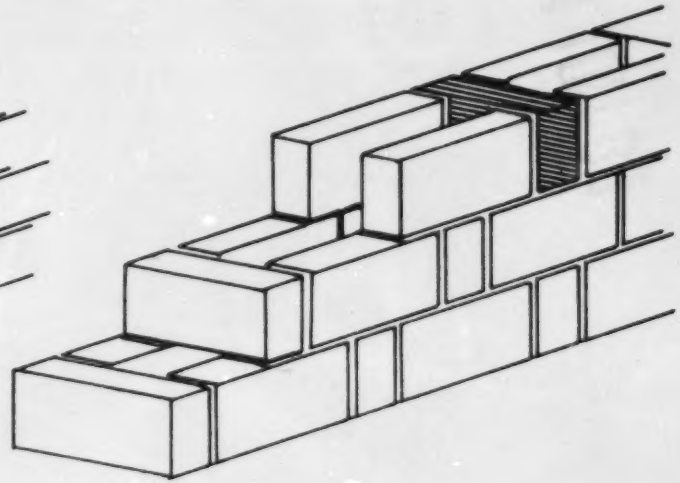
STRETCHER



SOLDIER



HEADER



ROWLOCK

TM-4

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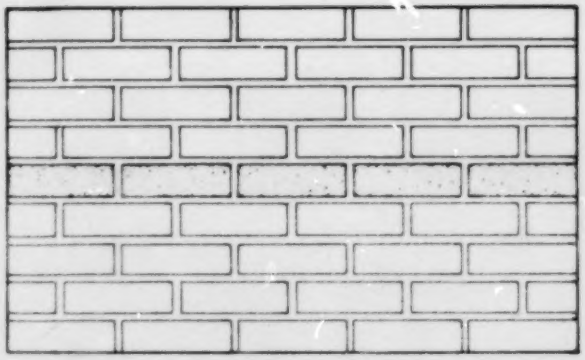
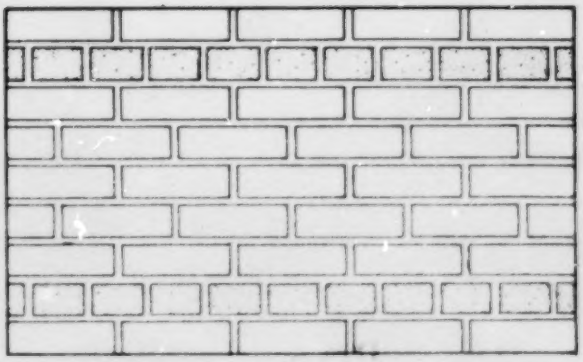
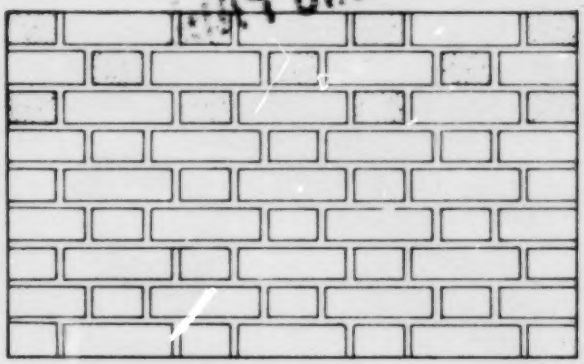
KINDS OF BRICK BONDS



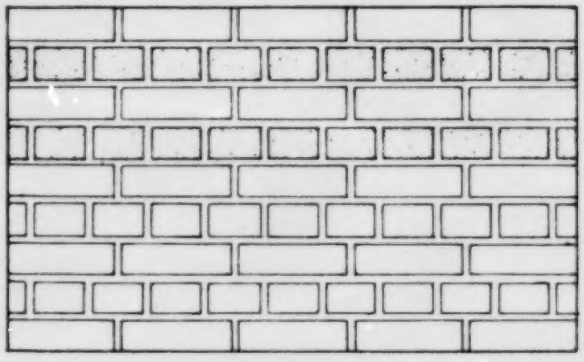
RUNNING BOND OR AMERICAN BOND



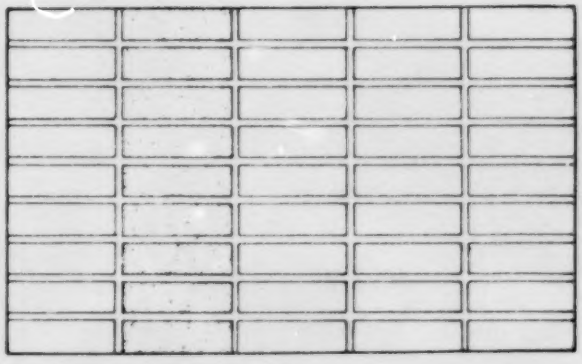
COMMON BOND - 6TH COURSE HEADERS



FLEMISH BOND

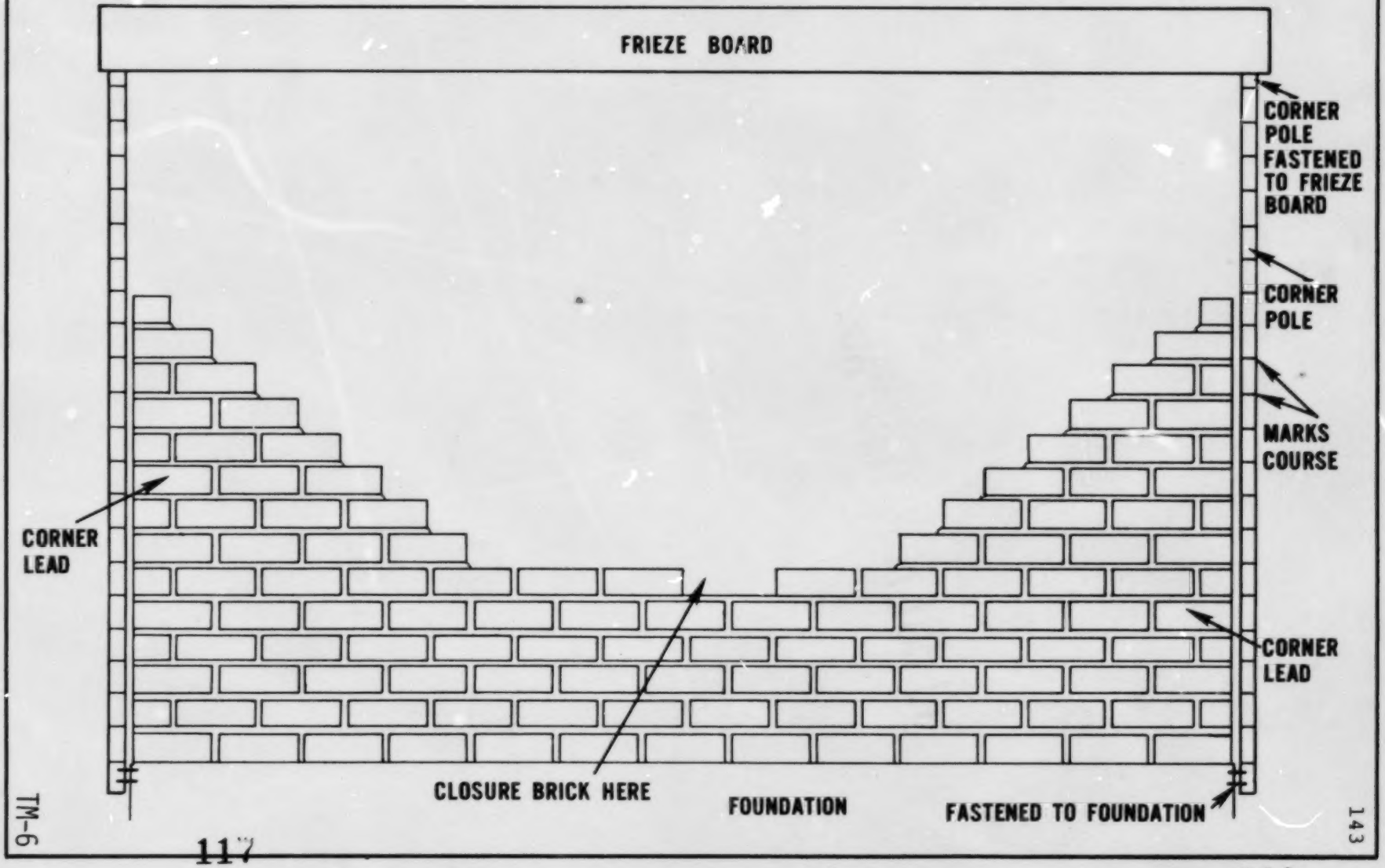


ENGLISH BOND



STACK BOND

TYPICAL WALL SECTION



TM-6

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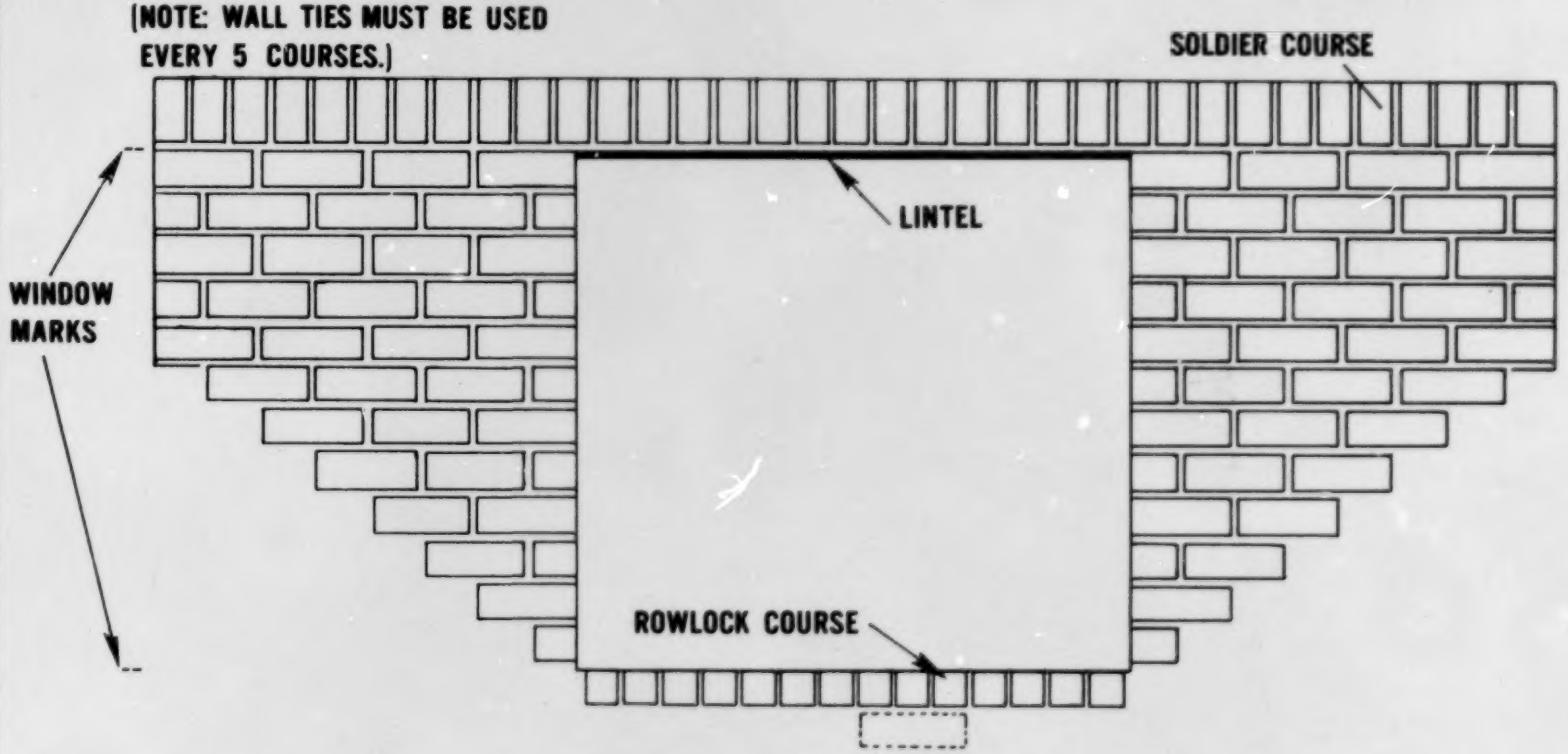
WITH A WINDOW



UNIT IV

MASONRY CONSTRUCTION

JOB SHEET 1--PREPARE A MORTAR MIX

I. Tools and materials

A. Mortar box

B. Mortar hoe

C. Shovel

D. Mortar mix

E. Sand

F. Water

G. Power mortar mixer

II. Procedures

A. Determine correct amount of mortar mix, lime, and sand

B. Prepare the mortar mix by hand

1. Place 1/2 of sand needed in a clean, dry mortar box

2. Place mortar mix on the sand

3. Place the remaining sand on top of the mortar mix

4. Mix the sand and mortar well, using the mortar hoe

5. Move all of the mixture to one end of the box, using the mortar hoe

6. Add water to the empty end of the box

7. Mix the dry mixture into the water

(NOTE: This mixing may be called "cut" because of the chopping action used.)

8. Add water while mixing until mortar is the proper consistency

9. Let mortar stand for 5 minutes

10. Mix again

(NOTE: To test for proper consistency, drag the tip of the trowel through the mortar. The "V" formed by the trowel should not slump and the mortar surface should be smooth.)

11. After mortar is mixed, ask instructor for further instructions

C. Prepare mortar mix with the power mixer

1. Pour small amount of water into the mixer
2. Start the mixer motor
3. Add 1/3 of sand needed
4. Slowly add all of the mortar mix
5. Add one or two shovels of sand and then a little more water
6. Continue step "5" until all of the correct amount of sand is in the mixer
7. Add water until mortar is of proper consistency

(NOTE: Instructor will want to check for consistency of mortar at this point.)

8. Dump mortar from mixer
9. Ask instructor about mortar use

D. Clean tools and equipment

1. Fill mixer 1/4 full of water
2. Turn on mixer and run it until paddles are clean
3. Dump the water into proper container
4. Rinse inside of mixer with water, using hoe
5. Rinse mortar from all tools
6. Store tools and equipment properly

E. Wash cement from your hands

UNIT IV

MASONRY CONSTRUCTION

JOB SHEET 2--SUPPLY A MORTAR STAND WITH MORTAR

I. Tools and materials

A. Wheelbarrow

B. Mortar hoe

C. Shovel

D. Mortar

E. Water in a bucket

F. Mortar stand

G. Trowel

II. Procedures

A. Re-mix the mortar in box with mortar hoe

B. Wet the inside of wheelbarrow and dump excess water

C. Fill the wheelbarrow 3/4 full of mortar, using the shovel

D. Push wheelbarrow to mortar stand location

E. Wet the surface of the mortar stand

F. Place 3 to 4 shovels of mortar onto the center of mortar stand

G. Mound the mortar in the center of the stand using the trowel

H. When mason uses mortar down to about 1 shovel, more mortar should be added to mortar board

I. Mix fresh mortar with mortar still on the stand, using the trowel

(NOTE: Keep stand close to the mason but do not get in the way.)

J. When job is complete, clean and store tools and equipment properly

K. Wash your hands

UNIT IV

MASONRY CONSTRUCTION

JOB SHEET 3--SPREAD MORTAR

I. Tools and materials

A. Trowel

B. Mortar stand

C. Mortar

D. Shovel

E. Row of bricks

II. Procedures

A. Set up mortar stand

B. Place 3 to 4 shovels of mortar on stand

C. Grasp trowel loosely in hand at base of handle

D. Re-mix mortar on the stand

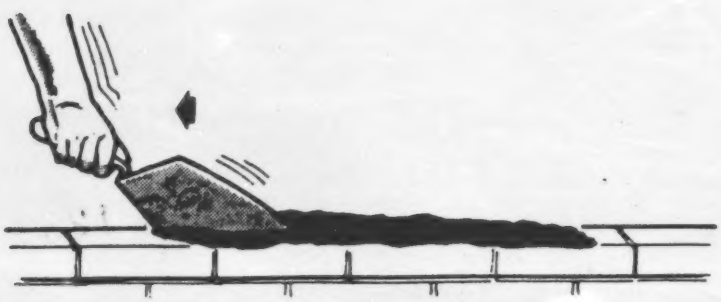
E. Scoop up a trowel full of mortar

(NOTE: Mortar also is called "mud" in the masonry trade.)

F. Place edge of trowel on top of brick row

G. Dump mortar while dragging trowel along the brick row

(NOTE: Row of mortar on brick should be about 2 1/2 inches wide and 2 inches deep on the brick row.)



H. Drag tip of trowel through top of mortar row

I. Lay brick and press into place

J. Scrape excess mortar squeezed from bed with trowel

K. Spread mortar left on trowel on the end of the brick just laid

L. Repeat steps B through K until job is complete

M. Clean all tools and equipment thoroughly

N. Store tools and equipment properly

O. Wash your hands

UNIT IV

MASONRY CONSTRUCTION

JOB SHEET 4--LAY A CORNER LEAD SIX COURSES HIGH

I. Tools and materials

A. Trowel

B. Mason level

C. Square

D. Masonry jointer

E. Broom

F. Mortar stand

G. Bricks

H. Mortar

II. Procedures

A. Establish square corner lines for two corners

B. Lay first stretcher course without mortar to check spacing

C. Set up stand and fill with mortar

D. Lay mortar for bed joint

E. Start at the corner and lay a line of seven bricks in one direction

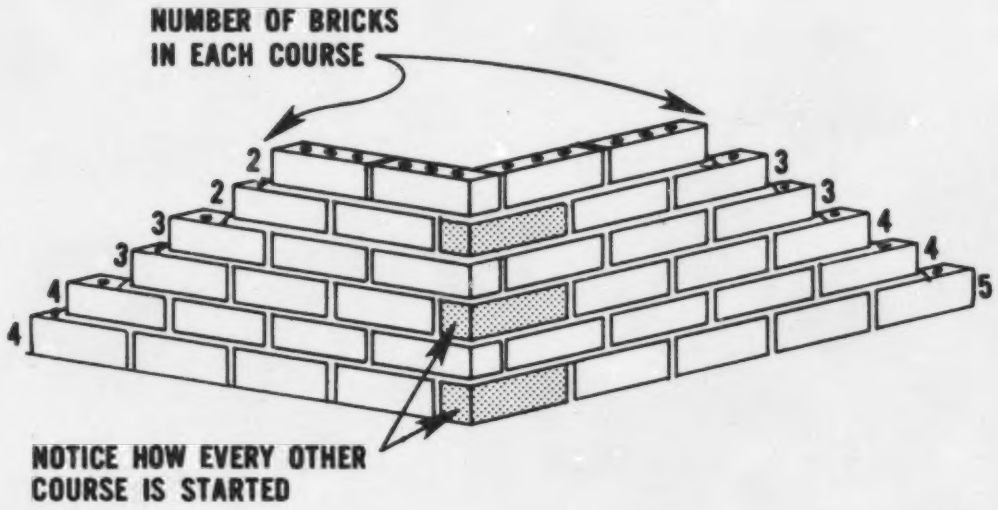
(NOTE: Be sure head joints are full of mortar.)

F. Start at first brick laid and lay seven bricks in the other direction

(NOTE: Be sure to keep line straight.)

G. Spread mortar on top of first course

H. Start at corner and lay another course, using drawing below for an example



I. Repeat procedure until corners are six courses high

(NOTE: Be sure to check for plumb and level on each course.)

J. Finish all joints with the mason's jointer

K. Brush off any mortar that may have dropped on the bricks with the broom

L. Clean and store tools and equipment properly

M. Wash your hands

UNIT IV

MASONRY CONSTRUCTION

JOB SHEET 5--COMPLETE A WALL BETWEEN CORNER LEADS

I. Tools and materials

A. Trowel

B. Mortar stand

C. Mason's line

D. Corner poles

E. Mason jointer

F. Mortar

G. Bricks

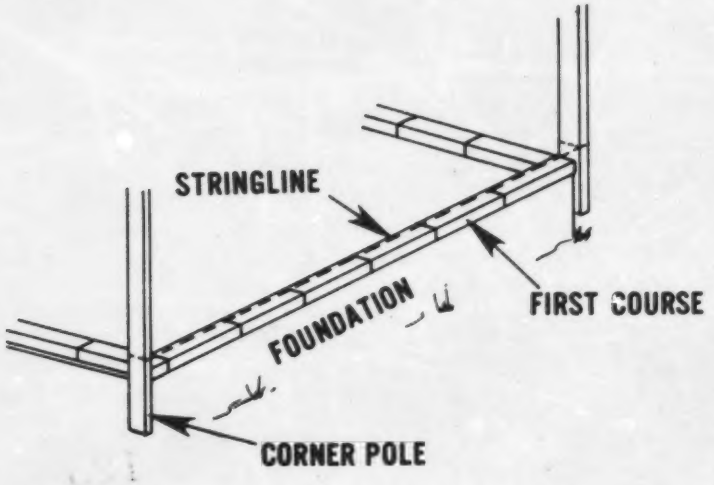
(NOTE: Corners built from Job Sheet #1 will be used.)

II. Procedures

A. Attach corner poles to corner leads

B. Plumb corner poles

C. Attach mason's line to corner poles and set for first course



D. Lay out bricks without mortar for first course to check spacing

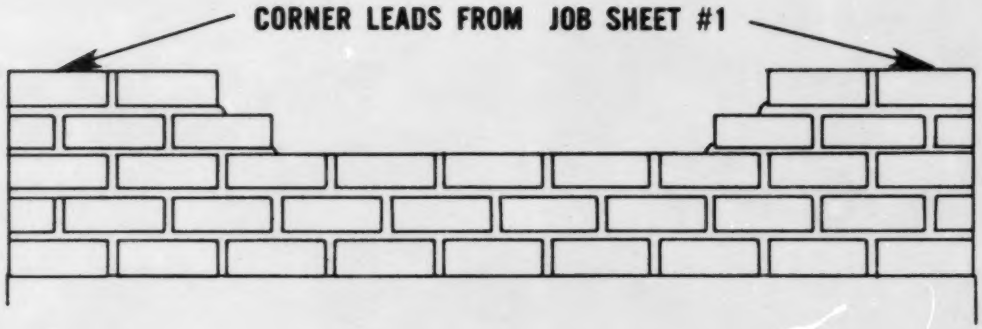
E. Set mortar stand near at hand

F. Fill mortar stand with mortar

G. Lay mortar with trowel for first course

H. Lay first course

(NOTE: Be sure to fill head joints full of mortar.)



I. Lay five more courses before using jointer

J. Use mason's jointer on all joints

K. Clean wall with the broom

L. Clean and store tools and equipment properly

M. Wash your hands

UNIT IV

MASONRY CONSTRUCTION

TEST PART 1

1. Match the terms associated with mortar preparation to the correct definition by placing the number of each term on the right in the correct blank on the left.

_____a.	Pre-mixed portland cement and lime used in making mortar	1. Plastic mortar
_____b.	Mortar that has just been mixed	2. Above grade
_____c.	Above the level of the ground	3. Pre-mix
_____d.	Below the level of the ground	4. Masonry cement
_____e.	Two or more ingredients mixed and packaged by the manufacturer	5. Bond
_____f.	To hold together	6. Below grade
_____g.	To push together	7. Consistency
_____h.	How firm or watery the mortar is	8. Compressive
_____i.	The settling action of plastic mortar	9. Slump

2. Identify the correct types of mortar mix below. Place a "✓" in the blank beside each of the correct types.

_____a. Type M

_____b. Type S

_____c. Type E

_____d. Type O

_____e. Type N

_____f. Type K

TEST

3. Point out the things that the worker should consider when mixing mortar by placing a "✓" in front of each listed below:

_____a. The cleanliness of the sand

_____b. The weight of the sand

_____c. The cleanliness of the water

_____d. The ratio for mixing the mortar materials

_____e. The method used for mixing

_____f. The height of the power mixer

_____g. The moisture content of the mix

_____h. The affect of hot weather on the mortar mix

UNIT IV

MASONRY CONSTRUCTION

TEST PART 2

1. Match the terms associated with wall construction to the correct definition by placing the number of each term in the blank.

_____a. Building the corners of masonry walls first

_____b. Metal strips used to hold a brick wall in place

_____c. The last brick laid in a course

_____d. A board that is used for trim along the top of the last course

_____e. A support for courses above wall openings

_____f. A layer of bricks, blocks, or stones in a masonry wall

1. Closure brick
2. Lintel
3. Wall ties
4. Frieze board
5. Course
6. Corner lead

2. List three types of masonry joints.

a.

b.

c.

3. Select the correct types of masonry joint finishes below. Place a "✓" in the blank beside the correct types.

_____a. Flush

_____b. Concave

_____c. "A" groove

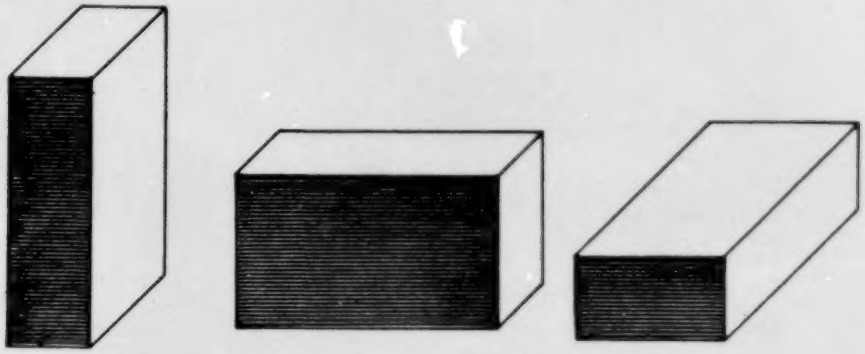
_____d. "V" groove

_____e. Raked

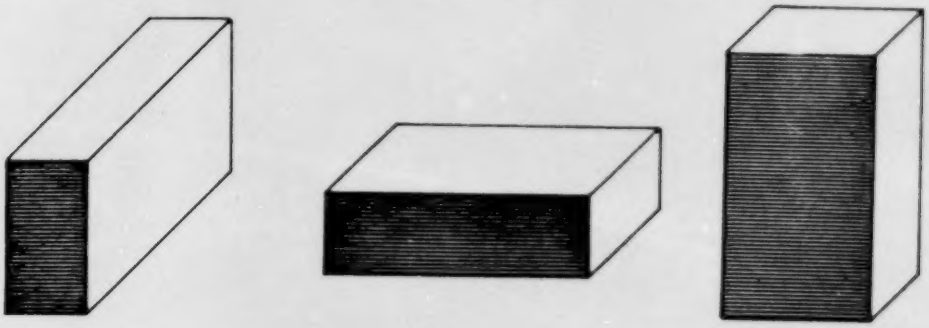
TEST

4. Identify the brick positions. Select the correct name for each from the list below and write it in the blank.

Stretcher	Sailor
Header	Rowlock
Soldier	Rowlock stretcher



a. _____ b. _____ c. _____



d. _____ e. _____ f. _____

5. Identify the kinds of brick courses below. Place a "√" in the blank beside the correct kinds.

_____a. Stretcher

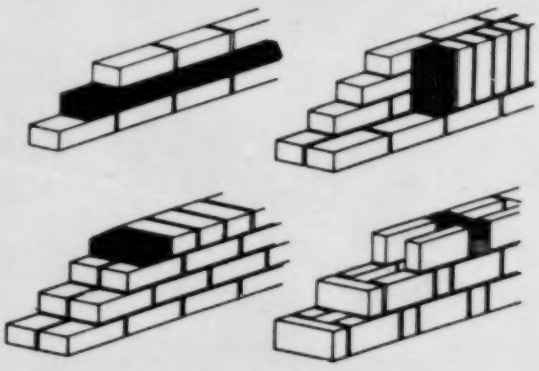
_____b. Header

_____c. Rowlock

_____d. Mortar bond

_____e. Soldier

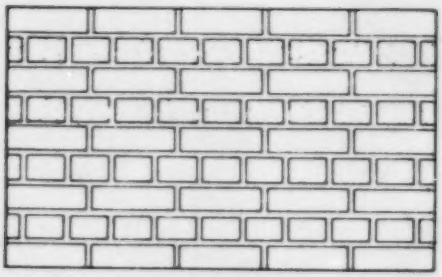
_____f. Box row



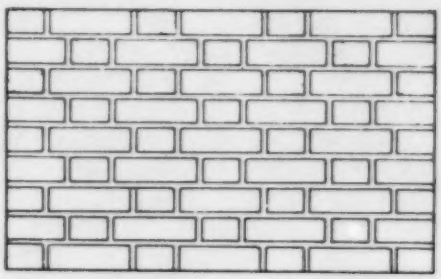
6. Identify the brick bonds. Select the correct name from the list below and write it in the blank.

American English

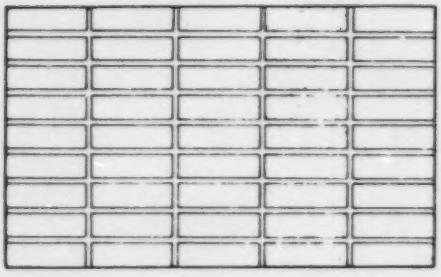
Flemish Stack



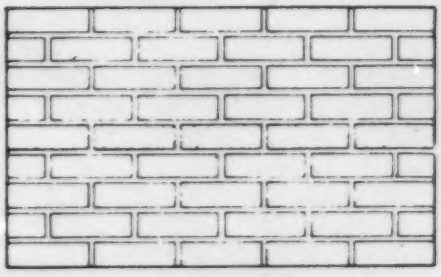
a. _____



b. _____



c. _____



d. _____

7. List two types of concrete block bonds.

a.

b.

8. Point out the things to consider when laying a corner lead by placing a "✓" in front of each.

_____a. The corner pole is plumbed after it is set in place

_____b. Corners are always laid last

_____c. The stretcher course is laid without mortar to check spacing

_____d. Check for plumb and level as corner is laid

9. Point out the correct considerations for laying a masonry wall by placing a "✓" in front of each.

_____a. Location of openings must be established

_____b. Size and height of opening is not important

_____c. Sheetrock is used for lintels

UNIT IV

MASONRY CONSTRUCTION

ANSWERS TO TEST

Part 1

1. ___4___ a.
___1___ b.
___2___ c.
___6___ d.
___3___ e.
___5___ f.
___8___ g.
___7___ h.
___9___ i.

2. ___✓___ a.
___✓___ b.
_____ c.
___✓___ d.
___✓___ e.
___✓___ f.

3. a.
c.
d.
e.
g.
h.

Part 2

1. ___6___ a.
___3___ b.
___1___ c.
___4___ d.
___2___ e.
___5___ f.

2. a. Bed
b. Head
c. Closure

3. ___✓___ a.
___✓___ b.
_____ c.
___✓___ d.
___✓___ e.

4. a. Soldier
b. Rowlock stretcher
c. Header
d. Rowlock
e. Stretcher
f. Sailor

5. ___✓___ a.
___✓___ b.
___✓___ c.
_____ d.
___✓___ e.
_____ f.

ANSWERS TO TEST

6. a. English

   b. Flemish

   c. Stack

   d. American

7. a. Straight

   b. Decorative

8. ___✓___ a.

   _____ b.

   ___✓___ c.

   ___✓___ d.

9. ___✓___ a.

   _____ b.

   _____ c.

UNIT V

MASONRY CLEANUP AND REPAIR

UNIT OBJECTIVE

After completion of this unit, the student will be able to clean brick and cement block walls and repair small sections of masonry. This knowledge will be demonstrated by completing the job sheets and satisfactorily completing the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student will be able to:

1. Match terms associated with masonry clean up and repair to the correct definition.
2. Identify the types of masonry cleaning agents.
3. Point out methods to use to prevent splatter on masonry walls.
4. List the equipment required to safely clean a wall.
5. Point out the considerations for cleaning masonry walls.
6. Demonstrate the ability to:
   a. Clean brick walls.
   b. Clean block walls.
   c. Repair mortar joints.

UNIT V

MASONRY CLEANUP AND REPAIR

SUGGESTED TEACHING PROCEDURES

I. Objective Sheet

A. Discuss Unit Objectives with student.

B. Discuss each specific objective with the student.

C. Have student complete the objectives in the most logical sequence for the shop organization.

D. Add any necessary objectives.

II. Information Sheets

A. INFORMATION SHEET 1--CLEANUP (NEW)

1. This sheet introduces the causes of stains, means of prevention and cleaning procedures.

2. Cleaning procedures can be critical to appearance of finished work.

B. INFORMATION SHEET 2--CLEANING BLOCK

1. Introduces the activities involved in cleaning new block walls.

2. Since it is difficult to predict cleaning effectiveness, always test for color change before cleaning large areas.

C. INFORMATION SHEET 3--MORTAR JOINT REPAIR

1. Introduces the process involved in mortar joint repair.

2. Demonstrating or showing repairs made in mortar joints would be helpful to the students.

D. INFORMATION SHEET 4--CONCRETE REPAIR

1. Introduces the various ways to repair cracked concrete.

2. A tour to identify broken concrete and the recommended ways to repair each might be a good way to close the unit.

III. Assignment Sheets

A. ASSIGNMENT SHEET 1--CLEANING NEW MASONRY

B. ANSWERS TO ASSIGNMENT SHEET

IV. Job Sheets

A. JOB SHEET 1--CLEAN A BRICK WALL

1. This sheet introduces the cleaning process.

2. Care must be used in handling acid solutions.

B. JOB SHEET 2--CLEAN A BLOCK WALL

1. This sheet introduces cleaning block walls with brushes and scrapers.

2. Acid should not be used on block walls.

C. JOB SHEET 3--MORTAR JOINT REPAIR

1. The introduction of repairing joints is introduced in this unit.

2. Repair of joints may be the most common masonry repair job.

D. JOB SHEET 4--CONCRETE REPAIR

1. This sheet introduces repair of cracks in concrete.

2. Actual repair should be used in the teaching process.

V. Unit Test

VI. Answers to Unit Test

VII. References:

A. Kicklighter, Clois E. Modern Masonry. South Hollond, Illinois: Goodheart-Wilcox Co., 1977.

B. Krek, Sr., R. T. Masonry Skills. Albany, New York:

C. Dalzell, Ralph J., and Gilbert Townsend. Masonry Simplified. Chicago, Illinois: American Technical Society, 1970

UNIT V

MASONRY CLEANUP AND REPAIR

INFORMATION SHEET 1--CLEANUP (NEW)

I. Terms and Definitions

A. Cleaning Agent--a solution used to remove mortar or stains from masonry

B. Hydrochloric acid--an acid when combined with water makes muriatic acid which is used to clean mortar from masonry

C. Proprietary cleaning agent--a product produced by a company which used to clean masonry; usually sold under specific trade names.

II. Cleaning New Masonry

A. Preventing Need For Cleaning

1. Proper storage of brick or block at the job site will help prevent dirt or stains.

2. Care in laying brick or block will cause clean up to be less.

a. Keep mortar pans and boards two feet form the wall to prevent splash.

b. Maintain proper consistency of the mortar to aid in keeping the brick clean.

c. Turn scaffold boards on edge to prevent splatter due to rain during a job.

B. Cleaning Agents

1. Hydrochloric acid--a solution of hydrochloric acid, muriatic acid is the most common cleaning agent.

2. Proprietary cleaning compound--Many different commercial cleaning agents are available for specific cleaning.

(NOTE: Always follow directions on the label!)

C. Tools and Equipment

1. Proper Clothing

(NOTE: Due to the nature of the work, a hard hat, rubber apron or pants, rubber boots and rubber gloves should be worn.)

INFORMATION

a. Hard hat--to protect from falling objects.

b. Rubber apron--protects clothes from the acid solution.

c. Rubber boots--used to keep feet dry.

d. Rubber gloves--gloves with long cuffs to protect the arms are required.

2. Tools

a. Steel scraper--a ridgid steel scraper is used to scrape mortor from the wall.

b. Stiff bristle brush--a nonmetallic brush is used to apply acid.

c. Water hose--a water hose with cutoff nozzle is needed to apply water to the work.

d. Bucket--a nonmetallic bucket is needed for the acid solution. A metallic container should not be used for acid solutions.

e. Ladder--for small areas a ladder can be used to obtain access to the work.

f. Scaffolding--for large areas a well-built scaffold makes work easier and safer.

D. Cleaning Procedures- New Masonry

1. The cleaning operation should be one of the last phases of a job. Do not begin until mortar has set and cured.

2. Dry clean the area. Remove large pieces of mortar with the scraper or wire brush.

3. Presoak the area to remove loose mortar and dirt. Wet the area completely to prevent the acid from being drawn into the surface of the brick.

4. Prepare the acid. Follow directions on the label and use a nonmetallic container.

a. Dark brick--use a mix of not more than one part acid to nine parts water.

b. Light brick--use a mix of not more than one part acid to fifteen parts water.

(DANGER: Always pour acid into water.)

5. Apply the acid solution and scrub the area with the stiff bristle brush.

6. Keep the area wet. Do not let the cleaned area or surrounding areas dry before being flushed with clean water.

7. Scrub the area to be cleaned with the brush. Stubborn areas may require that a piece of brick be used as a scraper to remove mortar. Clean the brick, not the mortar joints.

8. Clean small areas at a time, to prevent the cleaning solution from drying out and depositing the cleaning solution on the face of the brick.

9. Acid solution loses its strength after 5 to 10 minutes of contact with mortar.

10. Acid and disolved mortar must be flushed from the cleaned area to prevent stains.

UNIT V

MASONRY CLEANUP AND REPAIR

ASSIGNMENT SHEET 1--CLEANING NEW MASONRY

I.

Directions: Match the correct term listed below to the correct definition.

A. Proprietary Cleaning Agent
B. Hydrochoric Acid
C. Cleaning Agent
D. Muriatic Acid

1. _____ a solution used to remove mortar or stains from masonry.

2. _____ an acid when combined with water makes muriatic acid which is used to clean mortar from masonry.

3. _____ a product produced by a company which is used to clean masonry; usually sold under specific trade names.

II.

List the steps used to clean a new masonry wall:

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

UNIT V

MASONRY CLEANUP AND REPAIR

JOB SHEET 1--CLEAN A BRICK WALL

I. Tools and Materials

A. Stiff bristle brush (not metal)

B. Scraper

C. Water hose with nozzle

D. Non-metallic bucket

E. Cleaning agent (muriatic acid or proprietary cleaners)

F. Ladder or scaffold is necessary

g. Protective clothing--rubber apron or pants, boots, and gloves

II. Procedures

A. Dry clean the wall or unit with scraper and brush.

B. Presoak the wall with water.

C. Prepare the acid solution.

(NOTE: Always pour the acid into the water and use nonmetallic containers.)

D. Apply and scrub with a stiff-bristled brush.

E. Keep the area below clean with clear water to prevent acid and dissolved water from drying on the brick.

F. Scrub the brick, <u>not</u> the mortar joints.

G. Rinse the wall or unit with water to stop the acid reaction.

H. Repeat the process if necessary.

UNIT V

MASONRY CLEANUP AND REPAIR

INFORMATION SHEET 2--CLEANING BLOCK

I. Terms and definitions

Concrete Block--A solid or hollow masonry unit made of concrete

(NOTE: Types of block are covered in Unit III)

II. Cleaning Procedures

A. Block joints should be brushed immediately after they are painted

B. Care in laying block is the best cleaning process

C. Acid should not be used to clean block

D. Mechanical means such as a scraper, chisel, wire brush should be used

E. A piece of brick or block should be used to sand or rub the block

F. Paint can be removed with paint removers

(NOTE: Always do a small sample to test for color changes, etc.)

G. Experiment using different brick and block pieces to rub off mortar

H. Use commercial paint removers on block to test effectiveness

I. Consideration may be given to painting the complete unit to cover up the stain

INFORMATION

UNIT V

MASONRY CLEANUP AND REPAIR

JOB SHEET 2--CLEAN A BLOCK WALL

I. Tools and Materials

A. Stiff bristle brush

B. Scraper

C. Wire brush

D. Piece of brick or block

II. Procedures

A. Select samples of block that has different types of stains and amounts of mortar.

B. Using brushes, scrapers, and pieces of different brick or block, remove the mortar or stain.

C. Evaluate the results as a class.

D. Spray paint a block.

1. Attempt to remove the paint with: paint thinner, paint remover, wire brush and piece of block or brick.

2. Determine which was most effective.

(NOTE: The expense of removing paint from masonry walls is very high.)

UNIT V

MASONRY CLEANUP AND REPAIR

INFORMATION SHEET 3--MORTAR JOINT REPAIR

I. Terms and Definitions

A. Cracks- usually occur at mortar joints may be caused by accident or foundation settling or expansion

B. Mortar joint- the space filled with mortar between each brick

C. Tuck pointing- putting fresh mortar into defective joints

II. Mortar Joint Repairs

A. It is common to find cracks or joints across brick. The cracks can easily be repaired to prevent water from entering behind the masonry. Cracks could be caused by:

1. Improper mortar mix

2. Failure of expansion seams to work

3. Accident

4. Settling of building

5. Expansion caused by heating and cooling

B. For effective repair, old mortar must be removed.

1. A wide chisel is used to break up the mortar.

2. Some areas will require a small cape chisel to remove mortar.

3. Clean the joint with a mortar rake or pointed piece of steel.

C. Mix repair mortar

1. Use 1 part mortar mix to 2½ parts sand

2. Add water to make a pasty mixture

D. Wet the joint to be repaired

E. Apply the mortar to the joint to be repaired.

1. A tuck pointer tool is helpful.

(NOTE: Tuck pointer- a narrow short trowel for repair.)

INFORMATION

2. Use only small amounts of mortar until the joint is filled.
3. Finish the joint to blend with the rest of the wall.
4. Brush off excess mortar before it dries.
5. Keep area moist until mortar sets.

UNIT V

MASONRY CLEANUP AND REPAIR

JOB SHEET 3--MORTAR JOINT REPAIR

I. Tools and equipment

- A. Masonry chisel
- B. Hammer
- C. Cape chisel
- D. Mortar rake or metal piece
- E. Mortar mix
- F. Sand
- G. Container to mix mortar
- H. Tuck pointing tool
- I. Hawk, or mortar board, if available
- J. Ladder or scaffold (if necessary to reach cracks)
- K. Wall with cracks to repair. If not available, repair joint in wall in class practice wall.
- L. Brush

II. Procedures

- A. Clean joint
  1. Use wide masonry chisel to break out mortar
  2. Use mortar rake or steel to clean
  3. Small areas may require a cape chisel to break mortar
- B. Mix mortar for repair
  1. Use 1 unit mortar mix to 2½ sand
  2. Add water to pasty consistency
- C. Wet the joint to be repaired
  1. Use hose if available
  2. Water can be applied with a brush

D. Apply mortar to joint

1. Use tuck pointing tool and hawk
2. Apply small amounts
3. Fill the joint with mortar

E. Finish mortar joint

1. Finish the joint to blend in with the rest of wall
2. Brush excess mortar from brick before it dries
3. Keep area damp until mortar sets

F. Clean up tools and return to tool room

G. Clean up area and wash hands

UNIT V

MASONRY CLEANUP AND REPAIR

INFORMATION SHEET 4--CONCRETE REPAIR

I. Terms and definitions

A. Cement- a bonding agent that hardens when mixed with water

B. Concrete- a mixture of cement, sand, gravel, and water in varying amounts according to use

C. Epoxy- a glue which hardens when two solutions are mixed together

D. Screed- a straight piece of material such as a 2x4 board used to level wet concrete

II. Concrete Repair

A. Cracks- may be caused by:

1. Settling of ground beneath structure

2. Heating and cooling

3. Damage from accidents

4. Traffic to heavy trucks ect.

5. Lack of seams for expansion joints

6. Lack of sufficient reinforcement metal

B. Crumbling is usually caused by the wrong mix being used in pouring the oringinal or by freezing and thawing.

C. Means of Repair

1. Use rich mortar and fill cleaned crack

2. Break out and repour

3. Pour cover over old slab

4. Epoxy repair

5. Latex cement

(NOTE: Follow instructions closely)

INFORMATION

D. Repair is relatively easy, but needs to be done to avoid accidents and water from entering behind the crack.

1. Epoxy or latex compounds are expensive and should be used on relatively small areas.

2. Large areas should be repaired with a cement/sand mixture.

3. Areas to be repaired should be chipped out because the patch will not hold if old, loose, mortar remains.

UNIT V

MASONRY CLEANUP AND REPAIR

JOB SHEET 4--CONCRETE REPAIR

I. Tools and materials

A. Trowel

B. Cement & sand

C. Chisel

D. Hammer

E. Brush

F. Patching compounds

DO NOT RUN THIS PAGE

II. Procedure

(NOTE: This job sheet could best be accomplished as a class activity.)

A. Find cracks to repair or use stepping stones that can be broken

B. Accumulate at least 3 types of concrete patching material

C. Read and compare labels

D. Prepare each break for patching

1. Break off all chips and fine edges

2. Clean all loose or crumbled concrete

3. Brush all dust from area

E. Patch each crack as per directions from the package

F. Compare the types of patching as to:

1. Finish

2. Cost

3. Strength (break samples if available)

G. Clean and return all tools

H. Clean up area and wash up

UNIT V

MASONRY CLEANUP AND REPAIR

ANSWERS TO ASSIGNMENTS

ASSIGNMENT SHEET 1

I.

1. C
2. B
3. A

II.

1. Dry clean the area
2. Presoak
3. Prepare acid solution
4. Apply acid
5. Scrub the area
6. Flush with water

UNIT V

MASONRY CLEANUP AND REPAIR

TEST

1. Match the terms on the right to the correct definition on the left by placing the number in the blank.

___A.	An acid when combined with water makes muriatic acid	1. Cleaning Agent
___B.	Usually occur at mortar joints, may be caused by accident or foundation settling or expanding	2. Proprietary Cleaning agent
___C.	A strainght piece of material such as a 2x4 used to level wet concrete	3. Hydrochloric acid
___D.	A product produced by a company which is used to clean masonry	4. Concrete
___E.	A bonding agent that hardens when mixed with water	5. Cracks
___F.	A solution used to remove mortar or stains from masonry	6. Tuck pointing
___G.	A mixture of cement, sand, gravel, and water	7. Cement
___H.	Putting fresh mortar into defective joints	8. Screed

2. Identify four reasons cracks may occur in concrete

A.

B.

C.

D.

3. Test three methods of repairing cracks in concrete

A.

B.

C.

TEST

4. Identify the correct statements about cleaning masonry by writing True or False in the blank in front of each sentence.

_____ A. Muriatic acid is made by combining hydrochloric acid and water.

_____ B. Proper storage of masonry at the work site will prevent dirt and stains.

_____ C. Scaffold boards should be turned after work to prevent splatter.

_____ D. Swim suits should be worn when cleaning brick because you are going to get wet anyway.

_____ E. Acid solution looses its strength after 1 or 2 minutes in contact with mortar.

_____ F. Acid should not be used to clean block.

_____ G. Cleaning agents should be tested on a small area prior to large applications.

_____ H. Tuck pointing was discovered by a mason named George Tuck.

_____ I. Improperly mixed mortar is a cause of cracks in mortar joints.

_____ J. Crumbling is caused by freezing and thawing of concrete.

UNIT V

MASONRY CLEANUP AND REPAIR

ANSWERS TO TEST

1.

A. 3
B. 5
C. 8
D. 2
E. 7
F. 1
G. 4
H. 6

2.

A. Improper mortar mix
B. Failure of expansion seams to work
C. Settling of building
D. Expansion caused by heating and cooling

3.

A. Use rich mortar mixture
B. Break out and repour
C. Pour cover over old slab
D. Epoxy
E. Latex cement

4.

A. True
B. True
C. True
D. False
E. False
F. True
G. True
H. False
I. True
J. True